Instrument Manual

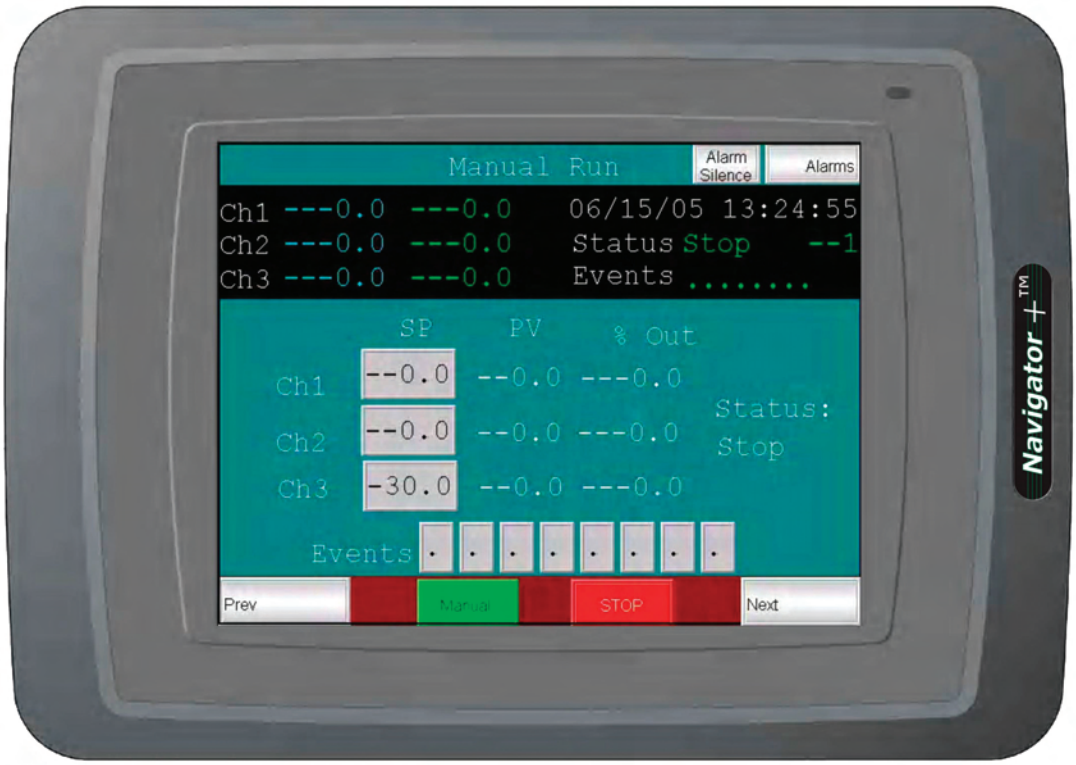
Navigator +™ Programmer/Controller

Envirotronics®

3/2006 Rev B

Envirotronics

Navigator +™ Touch Screen Programmer/Controller



Navigator +™ Touch Screen Programmer/Controller

The Envirotronics Navigator+™ Programmer/Controller is the newest instrument in the roster of touchscreen controllers from Envirotronics. Expanded communication possibilities include built-in RS232 and RS422/485 ports as well as Ethernet and both USB host and device connection ports. Remote management and "viewing" across an intranet or internet connection, the ability to add PC peripherals such as keyboard, mouse and printer, and high-speed connection for PC file transfer combine with the ease of touchscreen and intuitive command-screen design to make Navigator+™ a leap forward in programmer/controller technology.

Standard Features

- Touch Screen, TFT, 65,536 colors
- 640 x 480 display
- 400 MHz RISC CPU
- 32MB Intel Strata Flash, 64MB RAM
- Windows CE.NET 4.2
- RS232 (built-in) 9-pin D-SUB
- RS485/422 (built-in) 25-pin D-SUB
- Ethernet (built-in) 10/100Mbit RJ45/TP
- USB Host for keyboard, mouse, printers, etc.
- USB Device port for PC file transfer
- Internal CF memory slot for memory expansion 32 - 1024MB
- External CF data slot for data capture and extraction

Specifications

Navigator +™

Channels: 3 Process Variables

Display:
65,536 Colors
TFT Display
Backlight
Display: 6.5" Diagonal
Resolution: 640 x 480 Pixels

Operating System:
Microsoft Windows™ CE NET 4.2

Communications:
Ethernet 10/100 Mbit RJ45/TP
RS-232C 9-pin D-SUB
RS-485/422 25-pin D-SUB
Web server software

Storage: 1MB onboard, up to 1GB optional
- Test & data retrieval

Processors: 400 MHz RISC CPU
32MB Intel™ Strata Flash
64MB RAM

Peripherals: 1 USB Device for PC File Transfer
1 USB Host for Keyboard, Mouse, Printer (through PC)

Programming:
-Limited to onboard storage capacity

Software Features:
Full PLC diagnostics
Color graphic displays
TCP/IP networking
Real Time clock with battery backup

Analog Inputs:
Process voltage inputs 8 standard assignable
- expandable to 40 (optional)
16 bit resolution
T/C 0.1˚C or 0.1˚F
Full temperature range

Analog Outputs:
Standard 0 (none)
- up to 16 (optional)
Outputting your choice of information

Digital I/O:
Standard I/O; 0 (none)
- up to 128 in/128 out (optional)
Output 2A, 250 VAC
Voltage input 24 VDC

Data Logging:
60 second intervals
data, setpoints, process variables, etc.

Alarms: HLS-1, HLS-2, Circulator oil, HS oil pressure, HS thermal head, HS Hi/Lo pressure, LS oil pressure, LS thermal head SW, LS Hi/Lo pressure, HS water pressure, B oiler overtemp, Temp Sentry (optional), Open sensor.
-Up to 16 alarms

Electrical/Mechanical:
Panel mount
Power requirements 24 VDC (obtained through PLC on board)
Operating conditions:
During operation 0˚ to +55˚C
35% to 85% RH, non-condensing
During storage -20˚ to +70˚C
Input: 100-240 VAC 50-60Hz +10%-0%
Dimensions:
in. H 6.06 x W 8.62 x D 3.94
mm H 154 x W 219 x D 55
Weight: 2.5 lbs.
1.1 Kg

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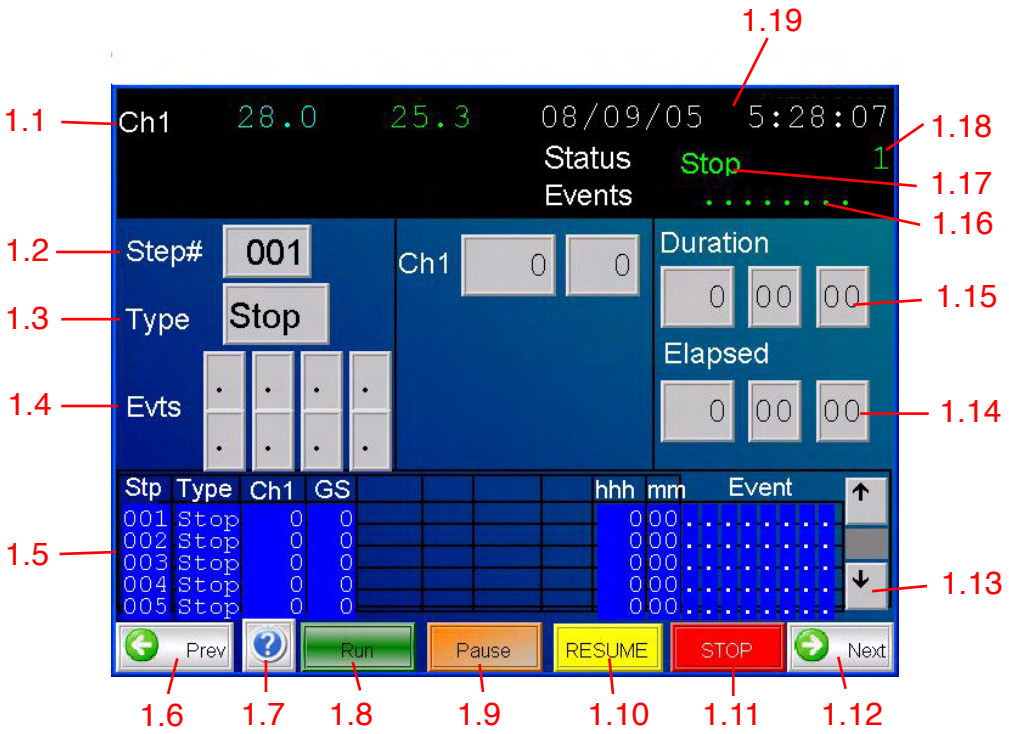
The following explains the different symbols and abbreviations used on the Navigator+™.

% Out Percentage of output for each channel.
% Percent as in Process variable (i.e. % relative humidity)
< Left arrow
> Right Arrow
Alarms
- **HLS-1** High Heat Limit
- **LS OPS** Low Stage Oil Pressure Switch
- **LS THS** Low Stage Thermal Head Switch
- **LS HLP** Low Stage Hi/Lo Pressure Switch
- **HS OPS** High Stage Oil Pressure Switch
- **HS THS** High Stage Thermal Head Switch
- **HS HLP** High Stage Hi/Lo Pressure Switch
- **HS WPS** High Stage Water Pressure Switch
- **TAS-1** Steam Generator Thermostat
- **CIRC O/L** Circulator Motor Overload Station 1
- **TEMP SEN** Temperature Sentry
- **SPARE 1 - 4** Spare Alarms - Use varies by application

Analog Refers to type of input or output
CHx A channel is a controlled value such a temperature, humidity, altitude, etc.
Example: Channel 1 is Temperature Values
Channel 2 is Humidity Values
Circs Circulator; Refers to the air circulation motor circuit.
Comps Compressors
Comp. Compensated type analog input device
Comp Ch Compared channel for Compensated input.
Config Configuration; Refers to the settings required to accomplish the desired task.
Control Ch# See CHx above
D % Derivative Percent
D time Derivative Time
Dd Date
DEL Delete; Removal of a step or program
Dev. Deviation; Difference between desired and actual
Dir Direct acting; Refers to cooling outputs
Duration Step length
Edit Edit; Used to make changes in a profile.
Elapsed Time Time a profile has been running in a program step
ESC Escape
Ev# Event; Accompanied by a number, typically for customer use.
Evts Events; Events are out relays that can be either manually operated or programmed into a profile.
File Save Saves a new or edited profile
Gain Proportional Gain % referred to as reset
GS Guaranteed Soak Used to put a profile step's programmed time into a hold mode. A value of "0" turns it off. Sometimes referred to as a window or within a plus or minus value of desired temperature.
hhh Hours; A profile steps time in hours
H Lim High limit
High The upper limit value.
Hold Program is holding
Hys Hysterisis
I Lag I Lag; Integral delay setting in seconds.
Insert Used in the program/edit profile screen
Loop Brings you from the end of a current step to the beginning of a previous step, allowing the profile to cycle or nest.
Low The lower limit value.
Log In Security password required.
Log Out Re-establishes security.
L Lim Low limit

NC	Normally closed or No Connection dependant on where used.
Machine Section	Reference to the location around the compressors.
Manual	From the main screen brings you to the manual operation screen of the controller. On the manual screen it turns the chamber on to run to the assigned setpoints.
mm	Minutes A profile steps time in minutes.
mmm	Month
Next	Refers to following page.
Outputs	Are the PLC "y" relay outputs
Password	Security requirement.
P Bnd	Proportional Band; Window for control to begin adjusting its outputs to achieve the desired setpoint.
PID	Proportional, Integral, Derivative
PID Type	PWM, Analog, Open Loop, or Not used,
PID Settings	Values in controller that make the controller control.
PLC	Programmable Logic Control
Prev	Previous
Profile	A Profile is a series of steps programmed together to accomplish a test sequence.
Profile run	Brings you to the start page for timed start or instant start.
Pmp Down	Used to keep the high side of the refrigeration system run ready.
Pump down	See Pmp Down
Pump dwn sel	Valve used to accomplish Pmp Down.
PV	Process Variable This is that actual value that the system is operating at for its corresponding channel
PWM	Pulse with modulation (Cycle Time)
Ramp	Changing a "SP" value in a profile to a new value. Found in the program editor.
Resume	Restarts a program profile.
Rev	Reverse acting; Refers to heating outputs.
Run	Runs the currently loaded program.
Soak	Dwell period at a given setpoint. Sometime referred to as a soak step. Staying at one set of values for an extended period of time.
SP	Set Point; The value at which you wish to run the system for its corresponding channel
Start step	The first step you can set to start a profile. Allows to start a profile at other than its beginning.
Status	Displays the mode (Stop, Manual, Profile#)
STOP/RUN	Program run state; Also used in a program profile as an end step to shut the test off.
Stg1	Stage 1
Stp	Step; A Step is a single line of a test program.
Timed Start	Waiting to start at start time. (Program Setup)
Timed Stop	Program stopped at selected stop time. (Program Setup)
Trend	Graphical display of the current process variables.
VAL	Value
X#	PLC input value accompanied with a number.
Y#	A "Y" with a number represents an output relay from the PLC
Yy	Year



1.1 Current Setpoint and process values for the channels of control. The first value on the left is the "Set Point" This is the desired value that you enter manually or are running from the program you created The next number is referred to as the "process variable" This is the actual value that is running for its corresponding channel.

1.2 Displays current step running in the selected profile. Can also be used to view another step by touching the block after the Step# and entering in another step number. When the program advances to another step it will reset to the current step running.

1.3 Type of step the current step is.

1.4 Event status for the current step

1.5 A 5 step view of the current profile in memory.

1.6 **Prev** – Brings you to the Trend/Setup screen.

1.7 **Help** – Brings you to a "Help" screen.

1.8 **Run** – Direct jump to the 'Profile/Login' screen.

1.9 **Pause** – Puts the current program on hold.

1.10 **Resume** – Resumes program in progress.

1.11 **Stop** – Puts the Navigator+™ controller in 'Stop' mode.

1.12 **Next** – Brings you to the Profile/Login screen (same as 1.8).

1.13 Scrollbar used to scroll up and down the profile currently in memory.

1.14 Indicator of time elapsed for the current step.

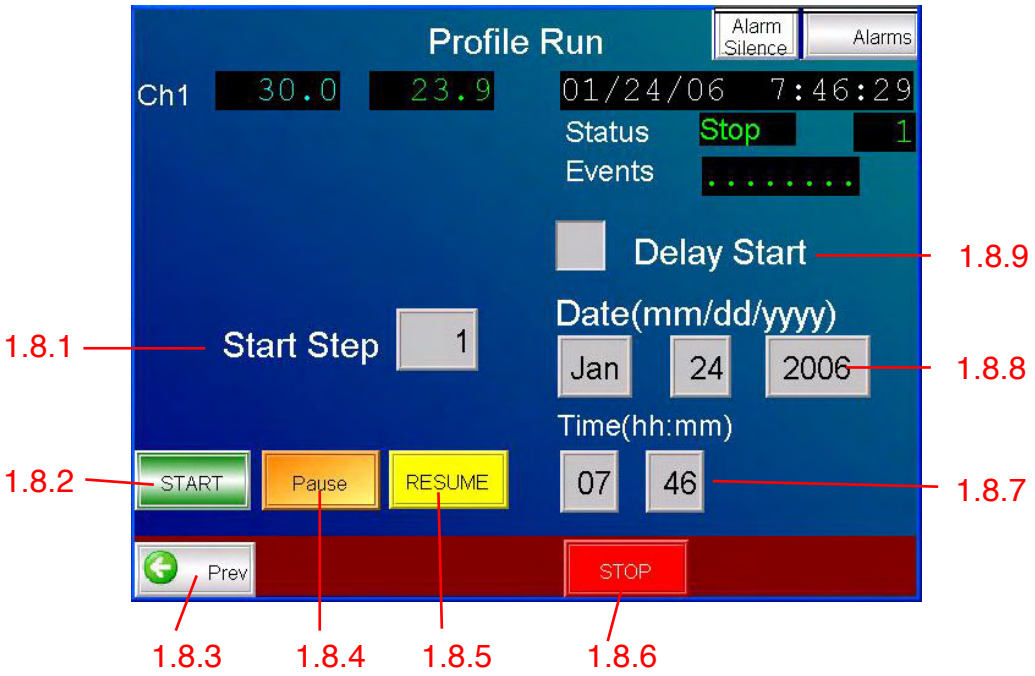
1.15 Duration control for the current step.

1.16 Displays current events that are on.

1.17 Current status of the controller (i.e. Profile, Manual, Trip, or Stop).

1.18 Current running step.

1.19 Current date and time.



1.8.1 **Start Step -** Reset all elapse timers and loop iteration counters then begins execution of the profile. Step to start execution of the profile currently in memory.
1.8.2 **Start –** Start the selected program to run.
1.8.3 **Prev**- Returns to program profile screen
1.8.4 **Pause** – Puts the current program on hold.
1.8.5 **Resume -** Resumes a previously paused profile.
1.8.6 **Stop** - Puts the Navigator+™ controller in 'Stop' mode.
1.8.7 **Time of day start –** Displayed in military time.
1.8.8 **Month Day Year** – Display for date of delayed start.
1.8.9 **Check mark** – Activates delay start feature if checked.

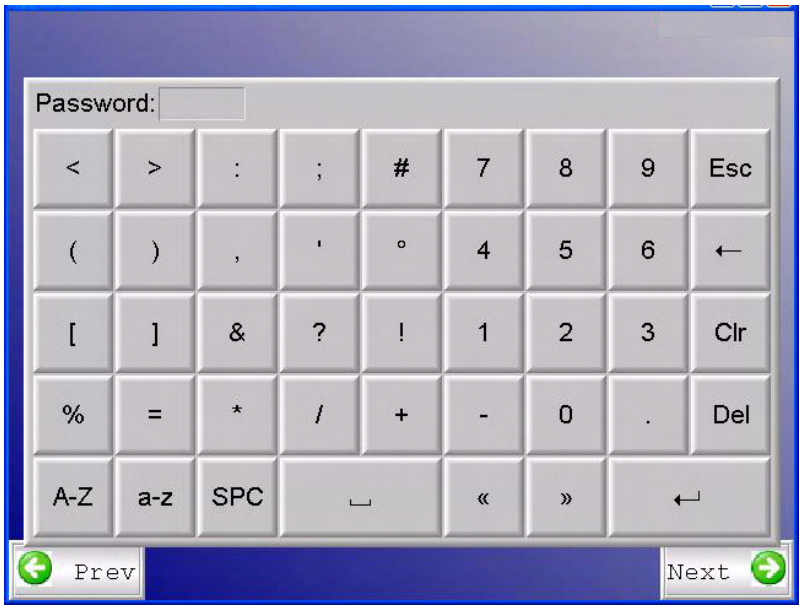
Start, via Program

Lets you start a selected preprogrammed profile.
See: Programming a Profile if no programs are available.
Note that you must have a program selected to run.
After selection is entered, the system will start the selected program.

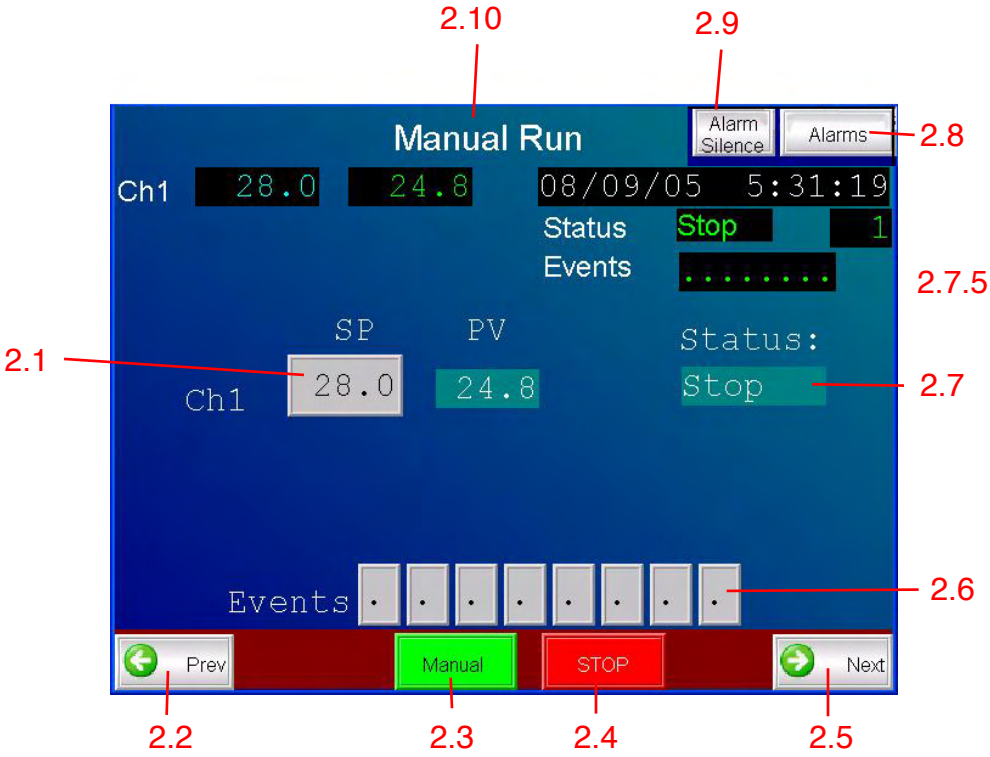
There are two ways to get to the profile run screen. You can scroll to the profile screen using the (Prev/Next) buttons. Look for the login, logout, profile screen and press the "Run Profile" button Figure 5 detail (5.4). or you can go from Figure 1 detail (1.8) and press the "Run" button. (You must be logged in)

Program Starting Step lets you assign a starting step number, other than step 1, to start at in the program. (Figure 1.8 detail 1.8.1) After the above has been completed press the "**start**" button. (Figure 1.8 detail 1.8.4). The program will load and begin to run. The Status will say "Profile" (Figure 1 detail 1.14). To Stop the program press any "Stop" button that you see.

Start Time Enabled allows you to enter a date and time at which you would like the program to actually begin controlling, if not immediately. This option will start both the system and the program. You must press the check mark button on the Navigator+™ for the option to work correctly. (Figure 1.8). (A level 4 password is required to start a program). Start Step (1.8.1). Delayed Start enabled (1.8.8) checked. Date and time (1.8.6)



1.12.1 Alpha-numeric Keypad



2.1 Current Setpoint and process values for the channels of control. Touching on the setpoint value will allow you to enter a new value. Press the key in the lower right corner of numberical keypad will enter value.
2.2 **Prev -** Brings you to the Profile/Login screen.
2.3 **Manual –** Starts the controller in manual mode.
2.4 **Stop** - Puts the Navigator+™ controller and system in 'Stop' mode.
2.5 **Next -** Brings you to the Trend/Setup screen.
2.6 **Events**- Touching the event buttons will turn them on/off. When the number is displayed the event is on.
2.7 Current status of the controller (i.e. Profile, Manual, Trip, or Stop).
2.8 **Alarms –** Direct jump to the alarm list screen.
2.9 **Alarm Silence-** Silences the alarm trip sonalert
2.10 **Manual Mode**-Displays mode of operation page name.

MANUAL CONTROL General information

Starting the Navigator+™

The Navigator+™ controller has 2 ways to start control. One method of starting control is by using manual control. The other method is by utilizing the Program Setup Mode and a program.

Starting the System Manually

Press the "Prev/Next" to scroll to the "Manual Run" screen. Figure (2). To enter a setpoint value, touch the corresponding button after the Ch# and below the SP Figure 2 detail (2.1). A number pad will appear. Enter the desired numerical value for the corresponding channel then hit the key in the lower right corner of the numerical pad.
Note. You may have up to 3 channels of control based on your application, enter as required for your system.
Next turn on or off the events that are desired. This is done by pressing the keys as per figure 2 detail (2.6) If a number is present the event is on.

continued…

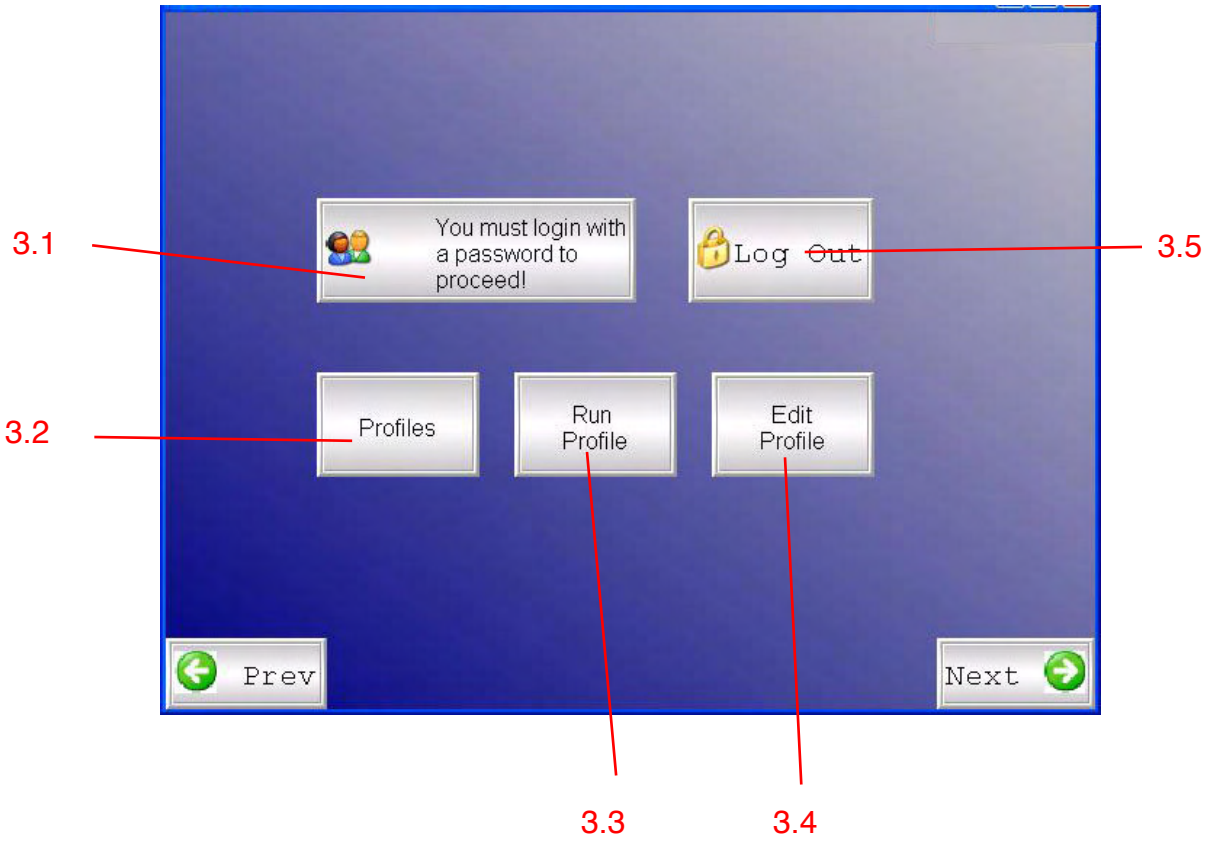
Channel 1 S.P. sets the setpoint of channel 1.

Channel 2 S.P. sets the setpoint of channel 2. (Optional)

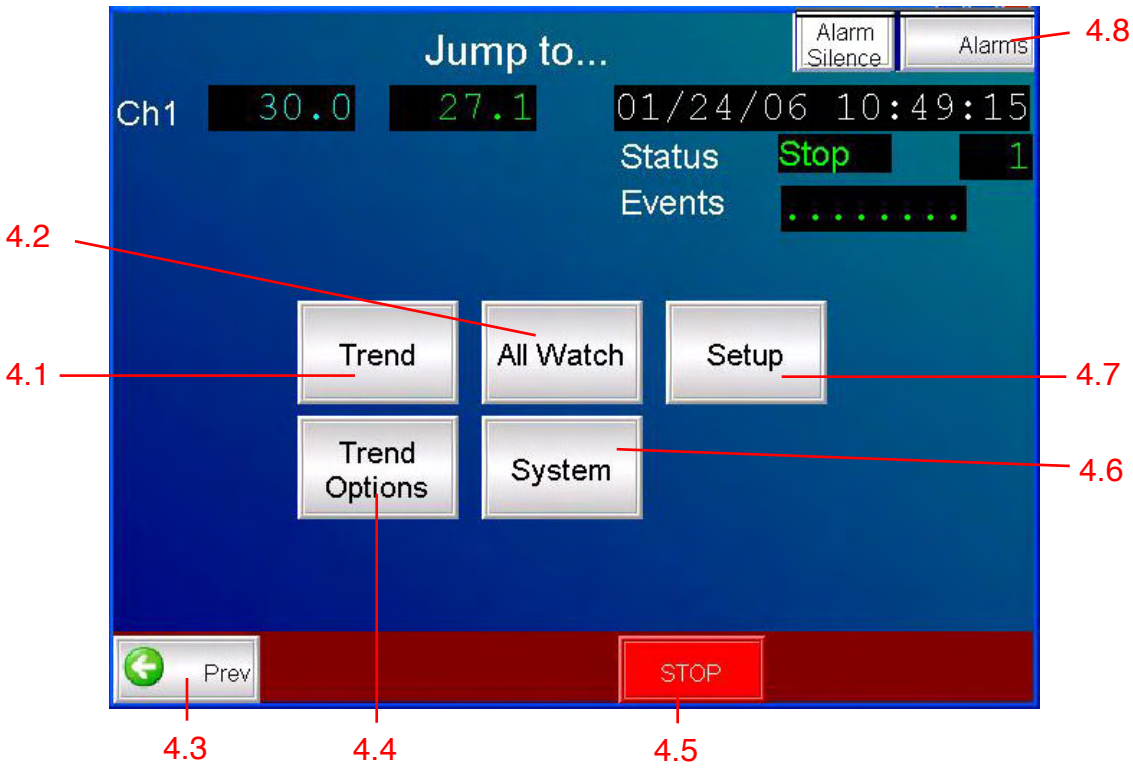
Channel 3 S.P. sets the setpoint of channel 3. (Optional)

Start Manual Mode

After the desired values have been entered press the "Manual" button at the bottom of the page. Figure 2 detail (2.3) The status area on the display will say "Manual" and the chamber will begin to operate provided all safeties are satisfied. Figure 2 detail (2.7). To **Stop** the manual operation press the stop key at the bottom of the page. Figure 2 detail (2.4). The status area on the display will say "Stop" and the chamber will shut off. Figure 2 detail (2.7). (Pump down will remain active if equipped).



3.1 **Log On -** Log On screen. There are 8 levels of Log on (Password Levels).
3.2 **Profiles -** Select one of the five stored programs.
3.3 **Run Profile -** Run Profiles brings you to the Start Time and Step of a profile. (See Fig. 1.8)
3.4 **Edit Profile -** Program editor for writing programs/profiles.
3.5 **Log Out -** Log Out



4.1 **Trend -** Direct jump to the graphic chart screen. See Fig 4.1

4.2 **All Watch –** Direct jump to the 'All Watch' screen. Allows user to watch the (x inputs and y ouputs of the PLC as system is running). See 4.2

4.3 **Prev -** Brings you to the Program screen.

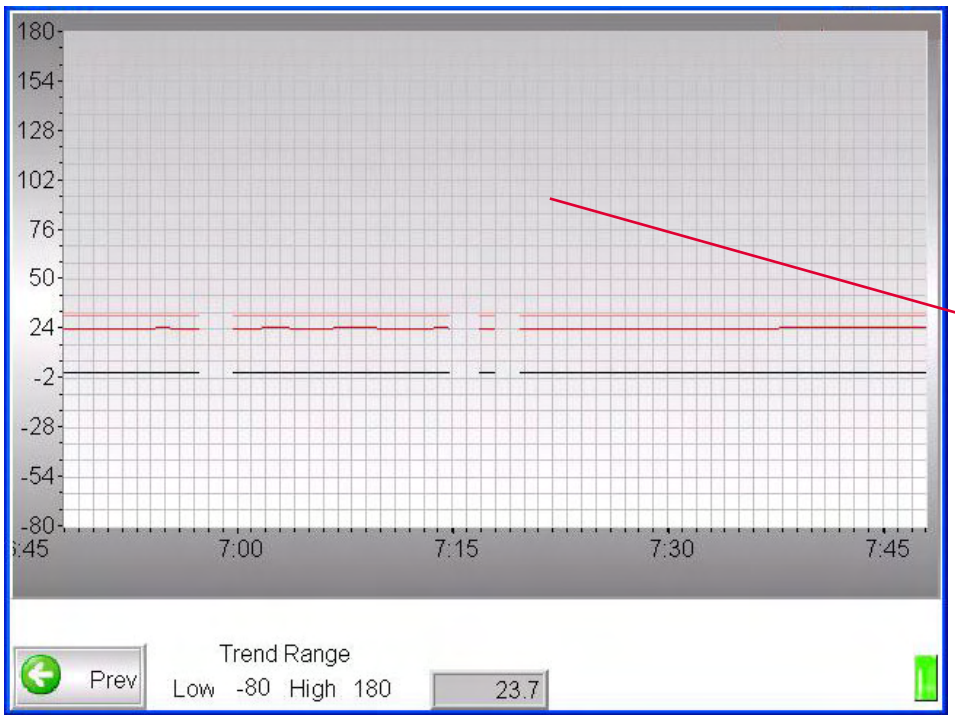
4.4 **Trend Options -** Graph Options

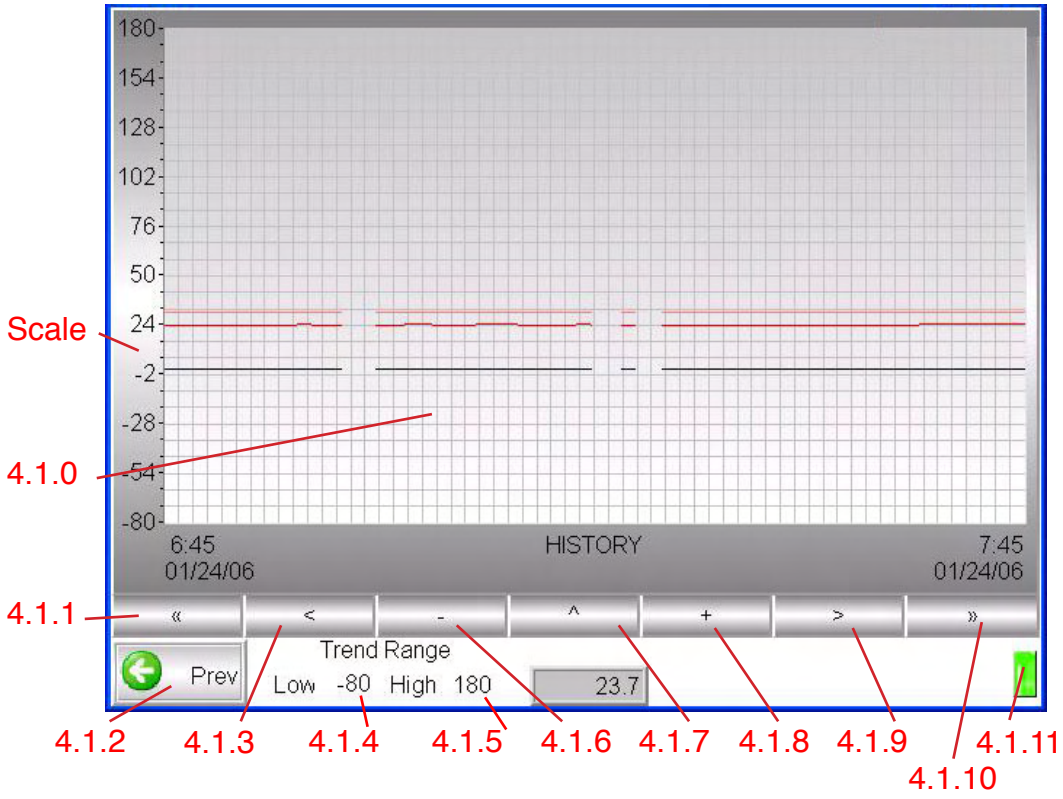
4.5 **Stop** – Stops System

4.6 **System** - Can view additional plc data. i.e. plc register values, memory bit status's for high or low. See Fig 4.6

4.7 **Setup -** Direct jump to the setup 'Setup Menu' screen. Location of PID, Alarm configuration, analog assignments, etc. See Fig 4.7

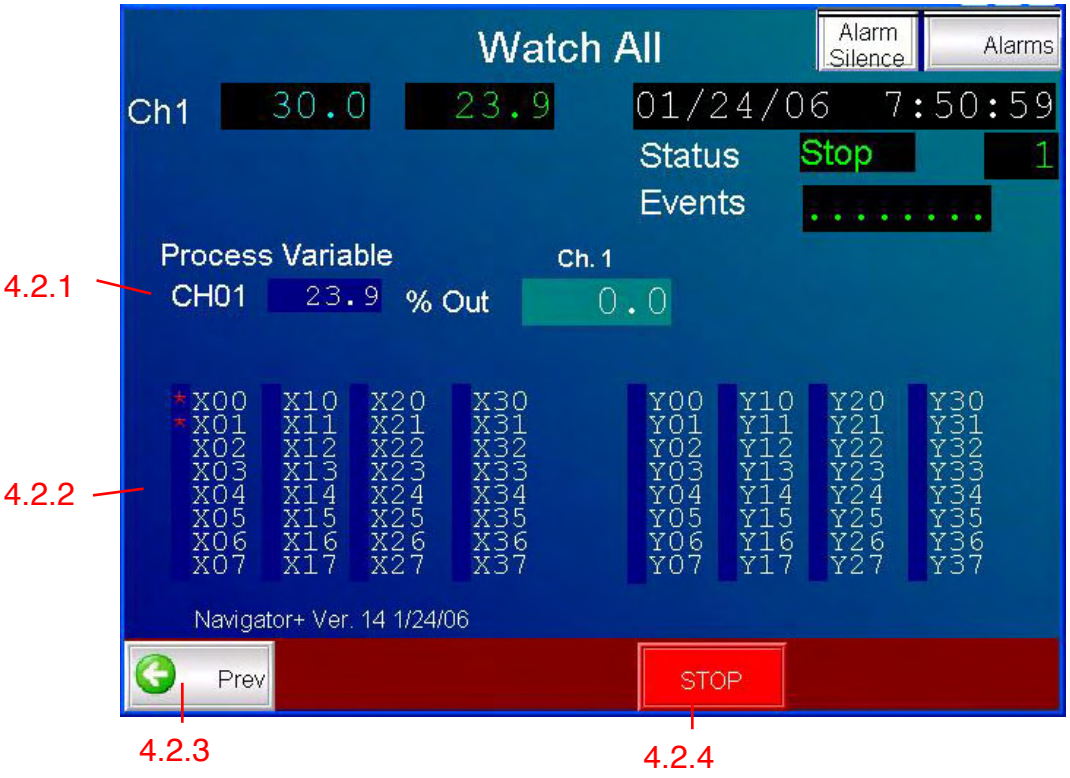
4.8 **Alarms -** Brings you to the alarms screen. See Fig 4.8


180
154
128
102
76
50
24
-2
-28
-54
-80
:45
7:00
7:15
7:30
7:45
Prev
Trend Range
Low -80 High 180
23.7
Touch for Taskbar



<< Increment Back
< Increment Back
+ Increase Time of Graph
– Reduce Time of Graph
> Increment Forward
>> Increment Forward

4.1.0 Touch anywhere on screen to have taskbar appear.
4.1.1 Increments Trend back one scale at a time "Time".
4.1.2 Exits the Trend.
4.1.3 Increments Trend back 25% of scale "Time."
4.1.4 Touch to set Trend low scale - numericdisplay appears.
4.1.5 Touch to set Trend high scale - numeric display appears.
4.1.6 Reduces scale "Time."
4.1.7 Return to current Time.
4.1.8 Increases Trend scale value "Time."
4.1.9 Increment Trend forward 25% of scale "Time."
4.1.10 Increments Trend forward one scale at a time "Time".
4.1.11 Turn Trend on and off. This only lights if Trending is turned on in Trend Options.



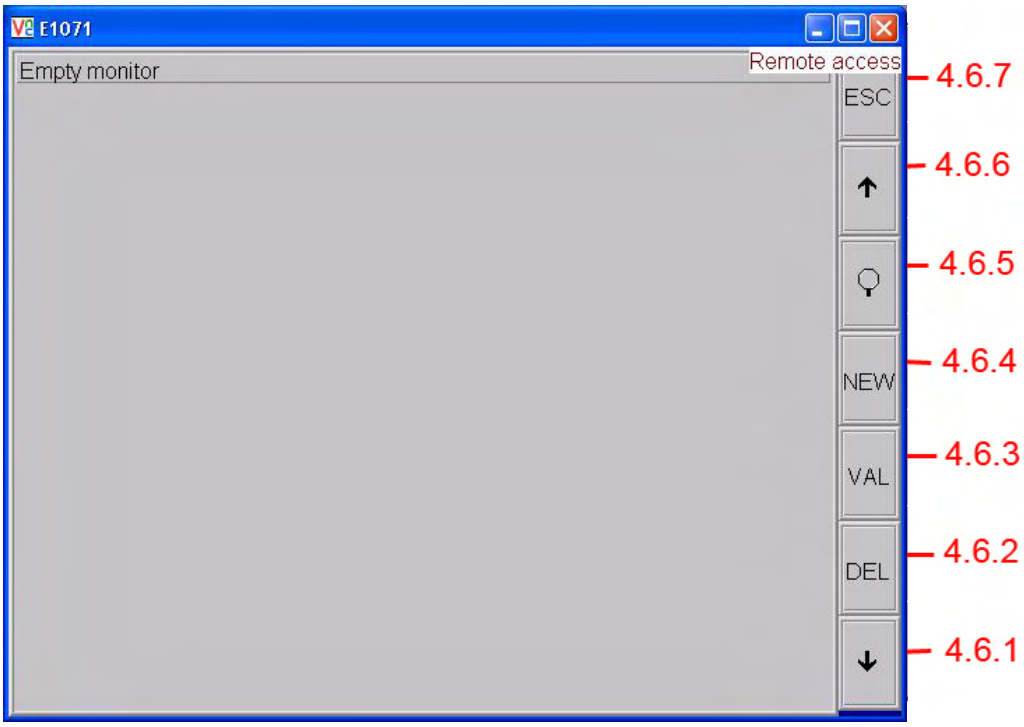
4.2 All Watch - Direct jump to the 'All Watch' screen.
Allows user to watch the (x inputs and y ouputs of the PLC as system is running).

4.2.1 Displays current P.V. and percentage of Output

4.2.2 Displays PLC (X input)
(y output) as on or off. Star is on.

4.2.3 **Prev** – Returns to Jump To screen.

4.2.4 **Stop** – Stops System

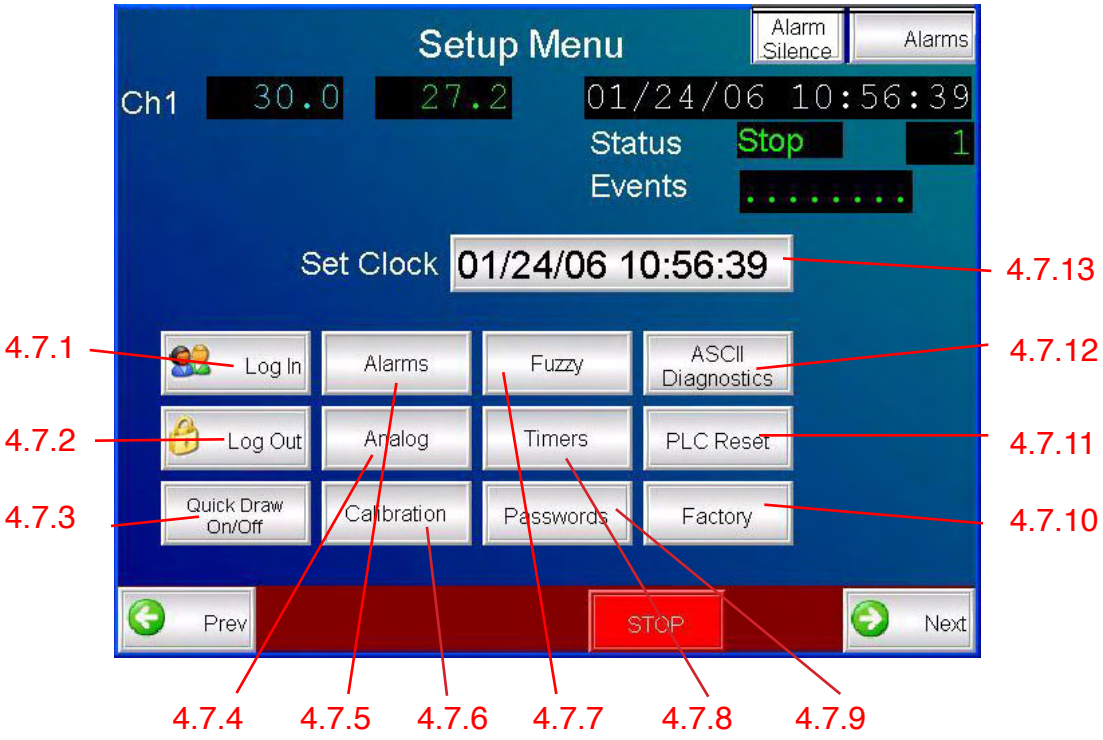


4.6.1 Scroll down arrow
4.6.2 Delete key
4.6.3 Overrides a value
4.6.4 Select a new bit
4.6.5 Zoom in scroll
4.6.6 Up Arrow
4.6.7 ESC; Returns to previous page

NEW

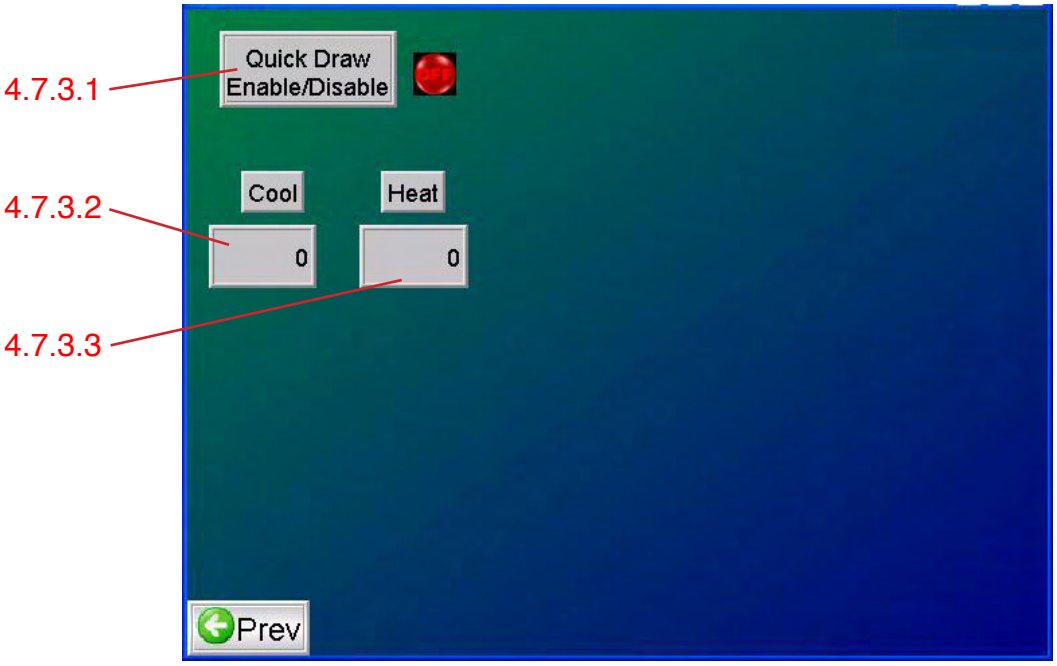
Will let you examine the contents of the PLC registers. You can choose the type of register by selecting one of the following followed by the number of the particular register you wish to view. This will create a list on the display as you select more and more registers. Touch **NEW** and enter the register you wish to view - such as D40

(1) M Memory Registers
(2) T Timer Registers
(3) C Counter Registers
(4) D Data Registers
(5) X PLC Input Status
(6) Y PLC Output Status
(7) S PLC State Registers



4.7 Setup – Direct jump to the setup 'Setup Menu' screen. Location of PID, Alarm configuration, analog assignments, etc.

- **4.7.1 Log In -** Logs you into the controller to make changes based on password level.
- **4.7.2 Log Out -** Logs you out of control change screens. The system will automatically log you out after 30 minutes
- **4.7.3 Quick Draw On/Off -** Enable function if applicable
- **4.7.4 Analog setup -** Allows for the setup values of channel inputs.
- **4.7.5 Alarms setup -** Allows for the setup for the system alarms.
- **4.7.6 Calibration -** Allows Calibration of the Navigator+ controller
- **4.7.7 Fuzzy -** Fuzzy control parameters
- **4.7.8 Timers -** Delay times for staged heat and cool
- **4.7.9 Passwords -** Allows for changing passwords up to level 6.
- **4.7.10 Factory -** Factory Settings
- **4.7.11 PLC Reset -** Used to reset the PLC for changes made in setup. Resets value changes made to the PLC. This must be done any time analog or digital items are changed on the Set Up pages or during calibration.
- **4.7.12 ASCII Diagnostics -** Communication diagnostics
- **4.7.13 Set Clock -** Time and date entry - must be presented exactly as shown.



Optional - Not included on all units

4.7.3.1 Quick Draw Enable/Disable - Turns Quick Draw On and Off.
4.7.3.2 Cool - Cool value. When cooling air is set below product. Used to set the difference between product Set Point value and when air temperature adjusts towards Set Point.
4.7.3.3 Heat - Heat value. When heating air is set above product. Used to set the difference between product Set Point value and when air temperature adjusts towards Set Point.

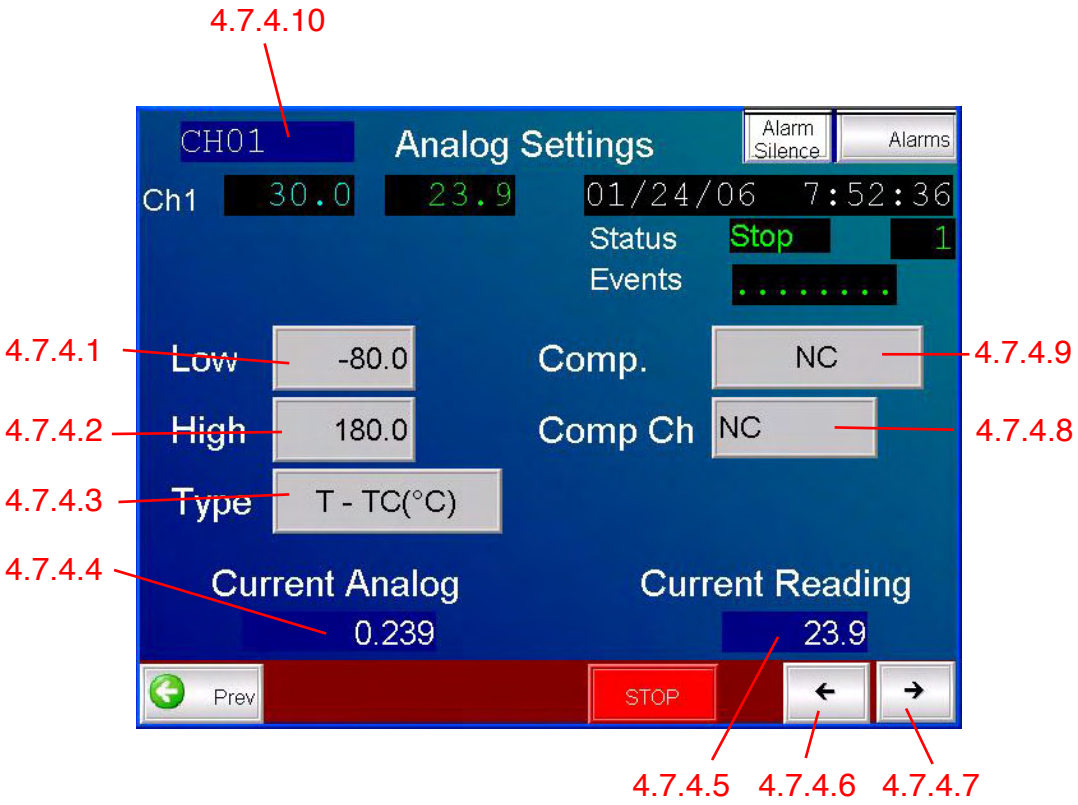
Quick Draw Operation:

Channel 1 is air temperature
Channel 3 is product temperature

In Manual Mode
Enter the value in Channel 3 for the desired product temperature. Then, within 15 seconds of entering the value in Channel 3, enter the value in Channel 1 for the maximum air temperature.

For example: if the product temperature desired is -40˚C and the maximum allowed air overshoot is -65˚C, you would enter -40 in Channel 3 and, within 15 seconds, enter -65 in Channel 1.

In Program Mode
Enter a program as outlined in section 5.6. You will enter the maximum air temperature in Channel 1 and the desired product temperature in Channel 3. If Quick Draw is not desired in a particular step, but is enabled, you must enter the same setpoint in both Channels 1 and 3 for that step, in order to disable it.



4.7.4 Analog setup - Allows for the setup values of channel inputs.

4.7.4.1 **Low**; Engineering unit low setting.

4.7.4.2 **High**; Engineering unit high setting.

4.7.4.3 **Type**; Input type.

4.7.4.4 **Current Analog**; Current actual analog reading.

4.7.4.5 **Current reading**; Current reading of the analog channel in the calculated engineering units.

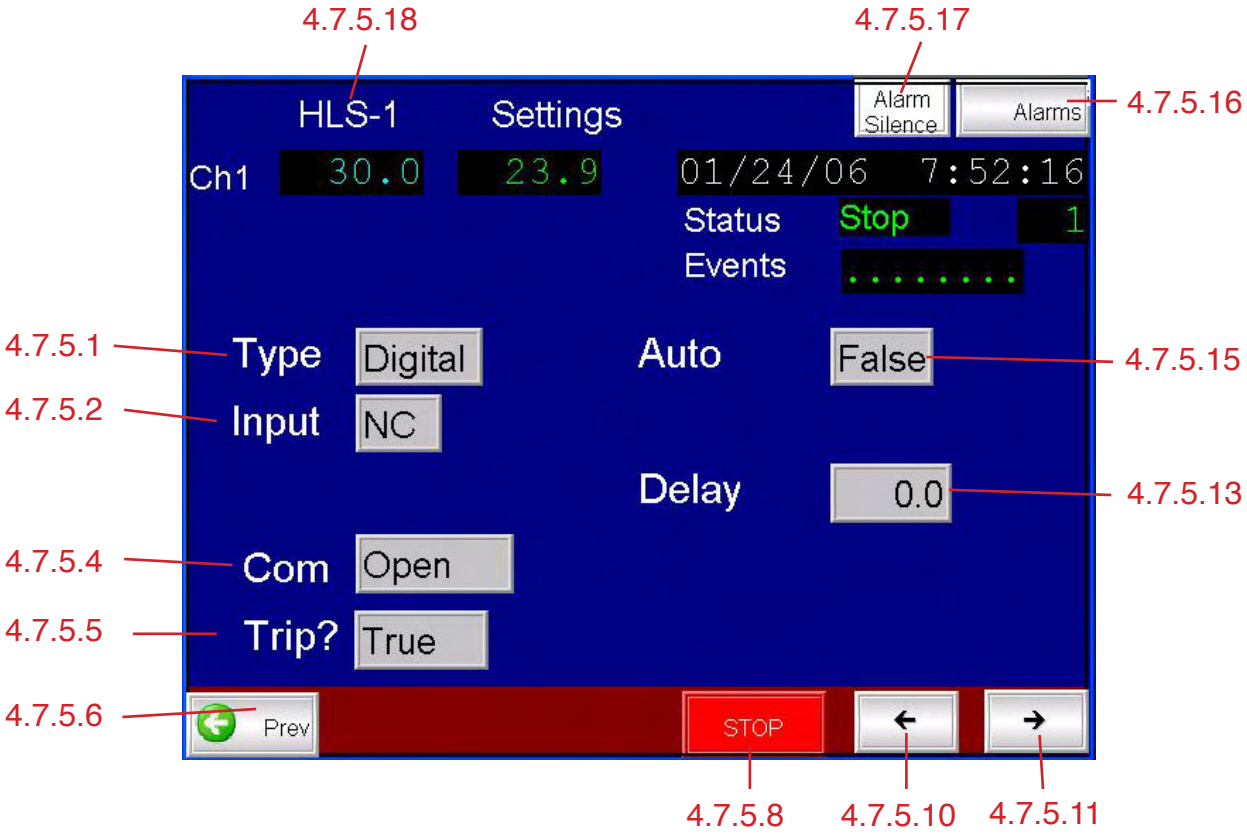
4.7.4.6 **Back Arrow**; Go to the previous analog channel for setup.

4.7.4.7 **Forward Arrow**; Advance to the next analog channel for setup.

4.7.4.8 **Comp Ch**; Analog channel used in compensation calculation.

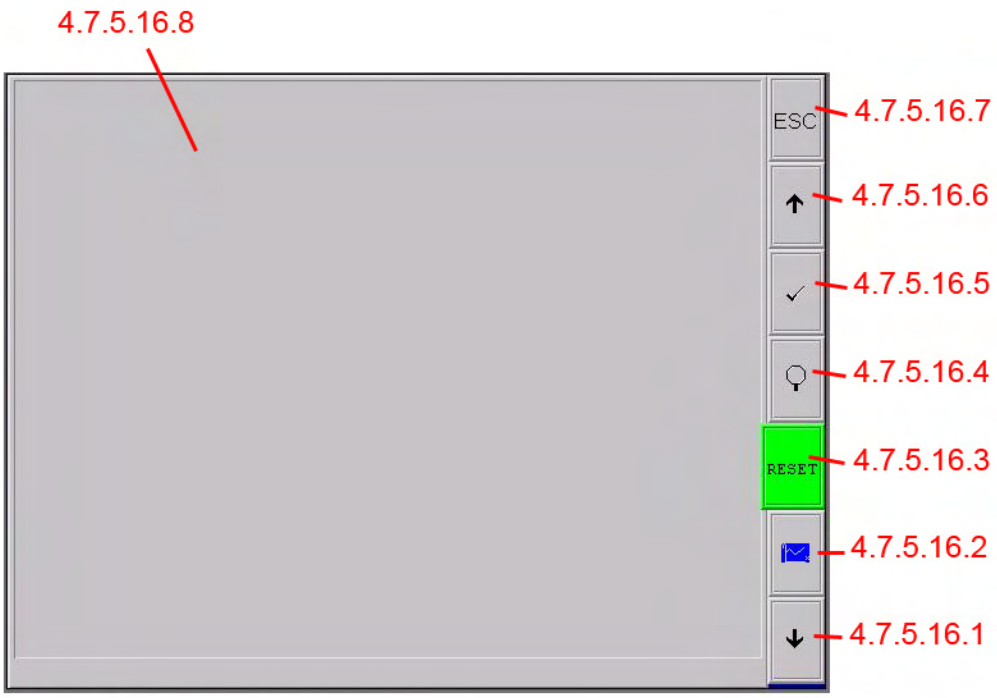
4.7.4.9 **Comp**; Type of compensation to execute.

4.7.4.10 Label of the current channel being setup.



4.7.5.1 Type of alarm signal (i.e. digital or analog) .
4.7.5.2 Input selection for digital alarms.
4.7.5.4 Common state of digital type alarms.
4.7.5.5 Specifies if controller should halt if alarm occurs.
4.7.5.6 Return to the Set Up menu.
4.7.5.8 Stop System.
4.7.5.10 Go to the previous alarm for setup.
4.7.5.11 Advance to the next alarm for setup.
4.7.5.13 Duration of time alarm must be active before registering. True is auto / False is manual.
4.7.5.15 Alarm automatic reset.
4.7.5.16 Brings you to the alarm page.
4.7.5.17 Silences the audible alarm bell.
4.7.5.18 This is the name of the alarm.

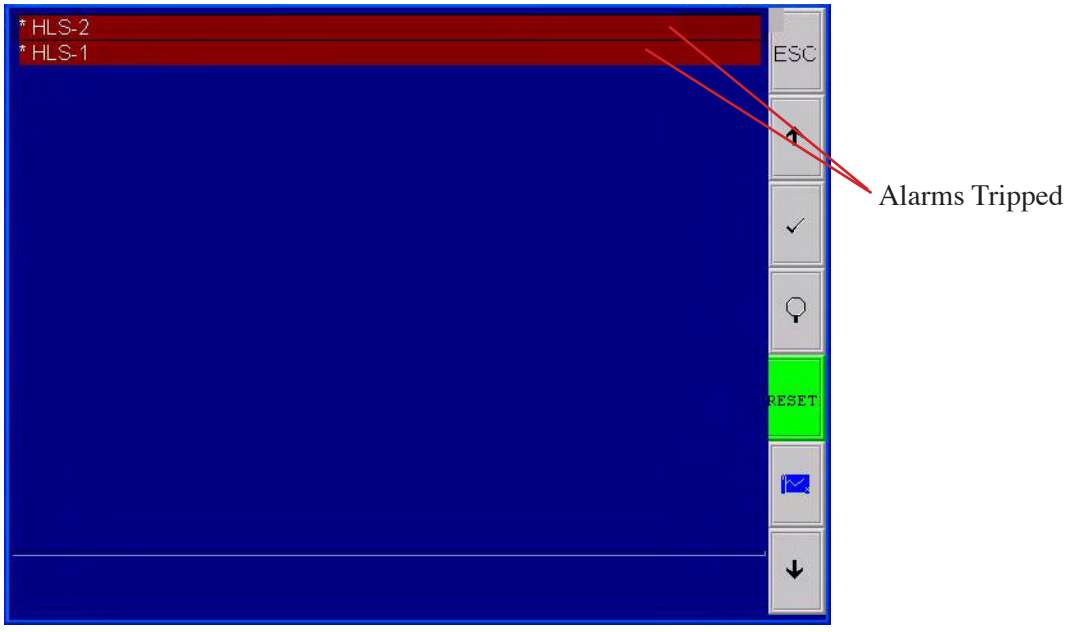
Accessible at Password Level 4



4.7.5.16 Alarms

4.7.5.16.1 **Down arrow**; Scrolls page down.
4.7.5.16.2 **Shows alarm information**
4.7.5.16.3 **Reset;** Resets the alarm
4.7.5.16.4 **Zoom**; Enlarges view.
4.7.5.16.5 **Check;** Acknowledges alarm
4.7.5.16.6 **Up arrow;** Scrolls page up
4.7.5.16.7 **ESC**; Escape, returns to previous page
4.7.5.16.8 **Alarm;** Displays alarm history and any active alarms.

Note: When an Alarm is tripped, it must be selected, acknowledged, and then reset.



S 02/01/06 8:49:24 HLS-2
S 02/01/06 8:49:15 HLS-1
ESC
RESET
Date/Time stamp when alarms were tripped.
Press to get information indicated above

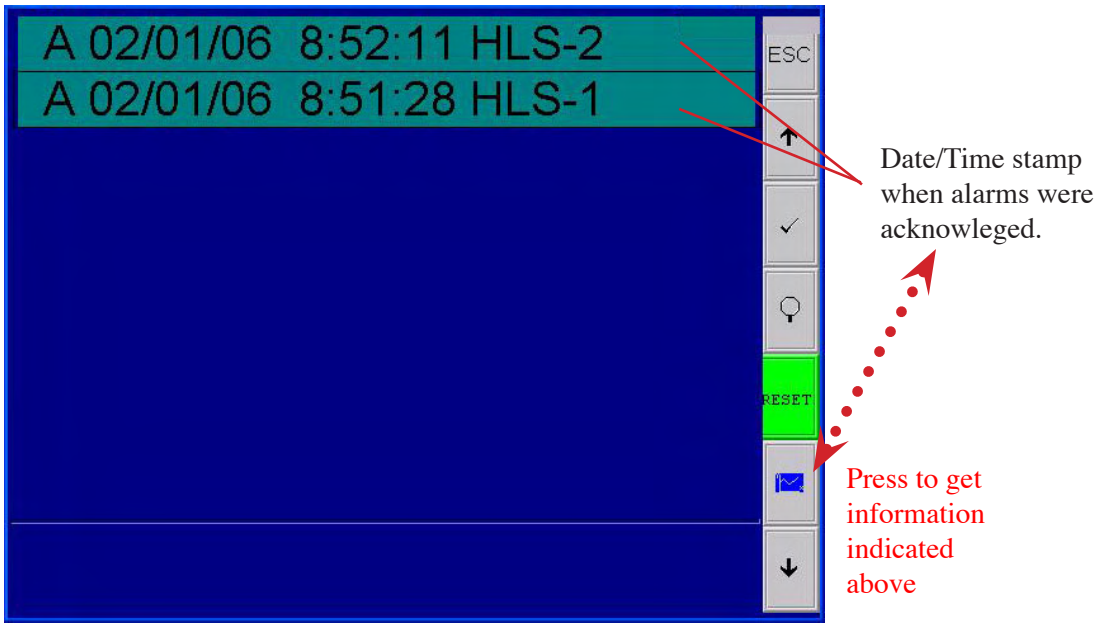

A 02/01/06 8:52:11 HLS-2
A 02/01/06 8:51:28 HLS-1
ESC
RESET
Date/Time stamp when alarms were acknowleged.
Press to get information indicated above

Figure 4.7.5.16.2 • Alarm Information

Navigator +™

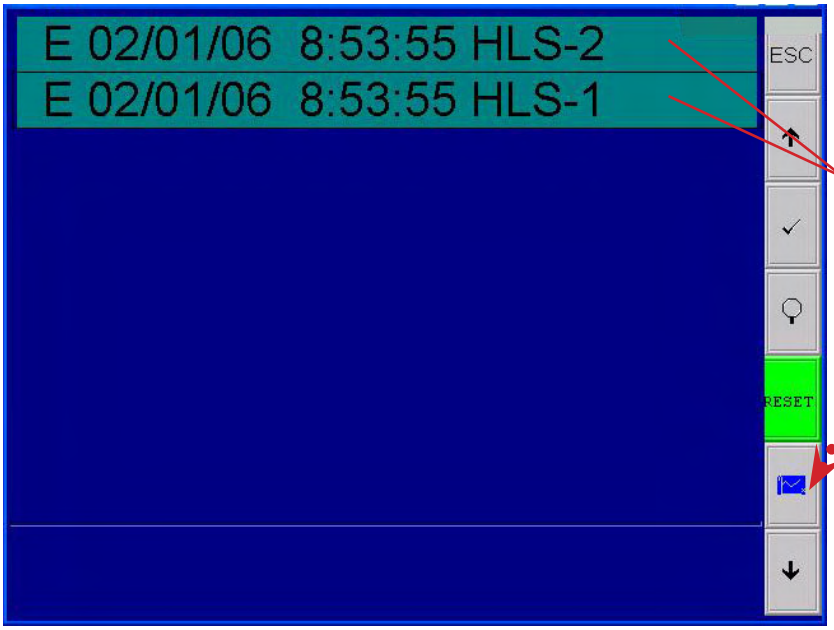
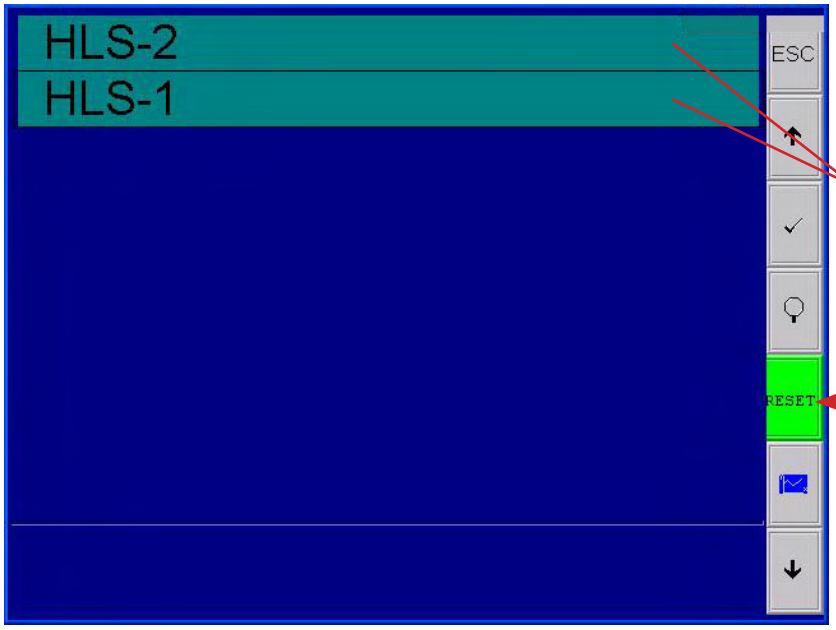
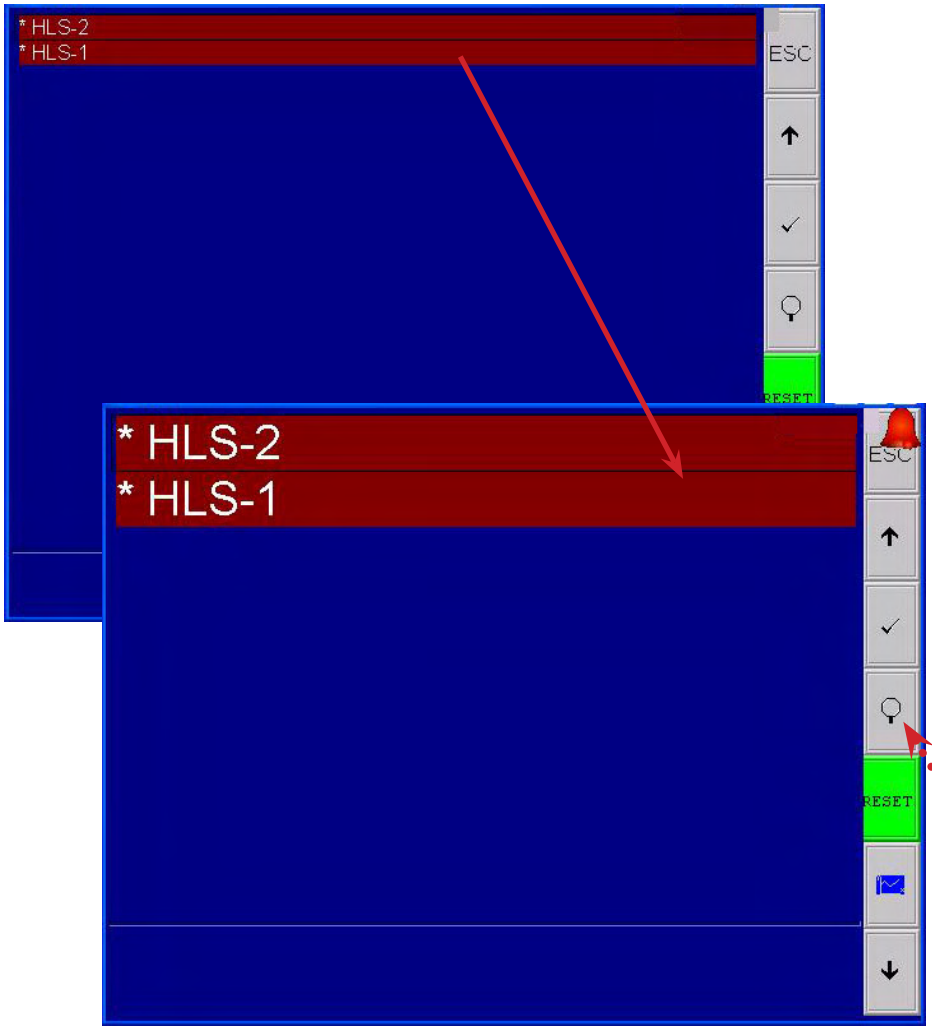


Figure 4.7.5.16.3 • Reset

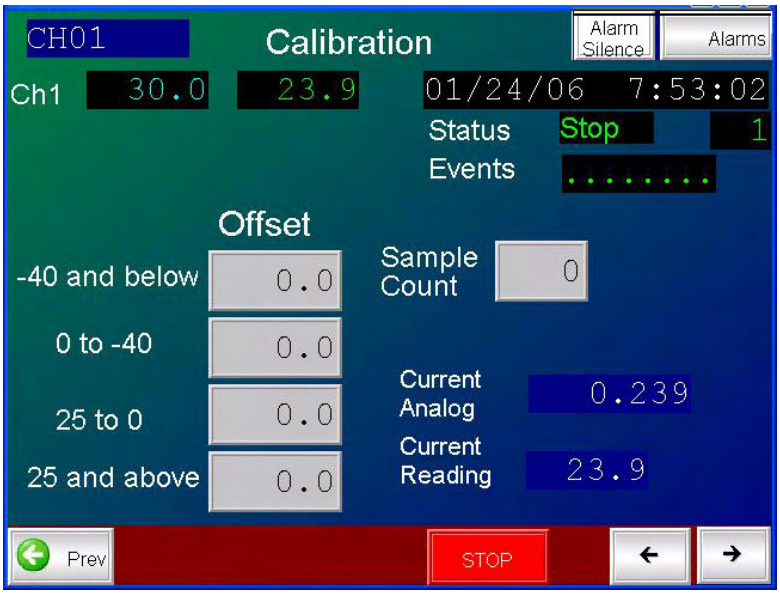
Navigator +™




* HLS-2
* HLS-1
ESC
RESET
* HLS-2
* HLS-1
ESC
RESET
Use Magnifying Glass button to enlarge.

* HLS-2
- HLS-1
ESC
RESET
"*" Represents alarm.
"–" Represents alarm acknowleged.

- HLS-2
- HLS-1
ESC
RESET
Both alarms acknowleged. Each must be selected seperately.
Press to acknowledge Alarm

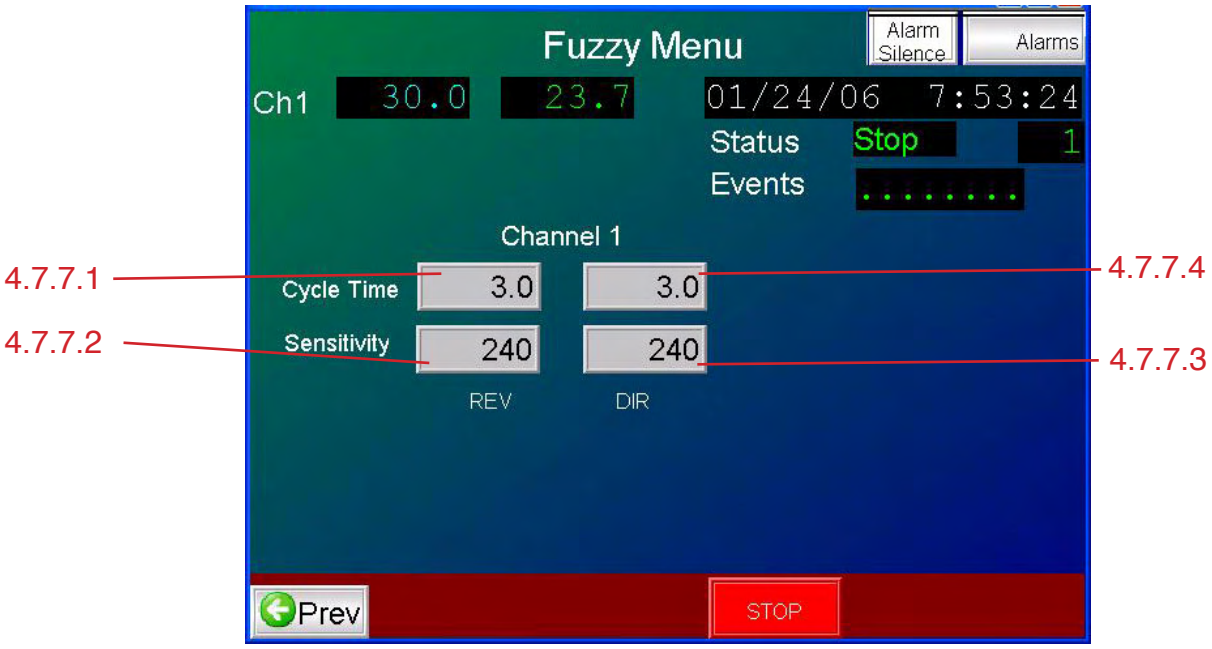


Calibration of the Navigator+™ chamber controller requires “Setup” access to the instrument. If a “Setup” level password was not provided contact your RTP for details. Once a “Setup” level password is entered…

1. Touch “More>>” button on the “Main Screen”
2. Touch “Setup” button on the “Jump to…” screen
3. Touch “Calibration” button on the “Setup” screen
4. Touch “Next” button to advance to the channel to be calibrated. Enter a “Sample Count” of 50, return to the “Setup” menu, touch “PLC Reset”, return to channel to be calibrated.
5. Attach a calibrated NIST traceable standard to the channel being calibrated. Record “Standard” vs. “Current Reading” data. Determine if “Current Reading” values are within permissible error limits. If an unacceptable degree of error is discovered, adjust the offset to obtain acceptable results.
6. Once finished, set “Sample Count” back to “0”, go to the “Setup” screen and touch “PLC Reset”.

Note:

Many factors can contribute to inconsistent and/or unacceptable levels of error. Good wiring and shielding practices are required for best results. Thermocouple input channel “High” and “Low” settings have no effect, however an offset value can be entered.



4.7.7.1 - Heat Output Cycle Time (REV) - defines the maximum ON to OFF to ON time window in which heating can be called for.

4.7.7.2 - Sensitivity Value of Heat Output (REV) - determines the responsiveness the controller uses to reach a channel setpoint when heating is required. A typical setting is a value of 160 to 240.

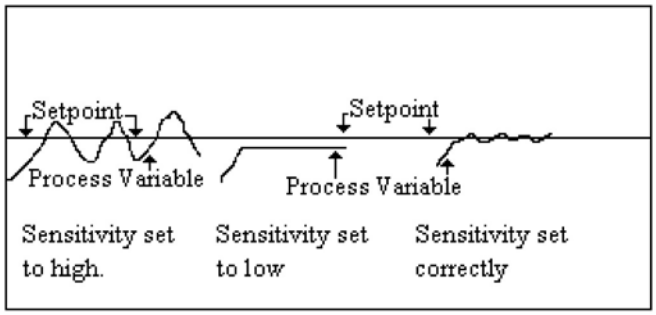
4.7.7.3 - Sensitivity Value of Cool Output (DIR) - determines the responsiveness the controller uses to reach a channel setpoint when cooling is required. A typical setting is a value of 160 to 240.

4.7.7.4 - Cool Output Cycle Time (DIR) - defines the maximum ON to OFF to ON time window in which cooling can be called for.

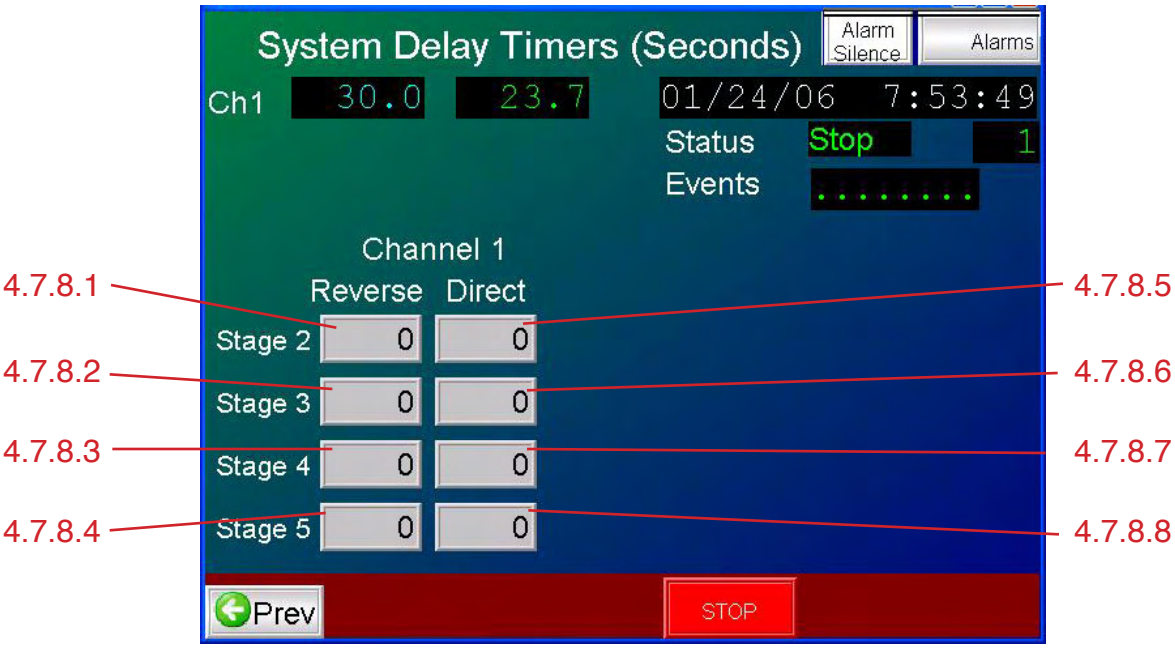
NOTE:

For most processes, a fast cycle time (less than 5 seconds) will produce a better control of loads with a fast response time. A typical setting is 3 to 4 seconds.

The sensitivity setting determines how often the Navigator Plus compares the setpoint and the process variable and acts on the difference. By entering a value in either of the sensitivity settings, the Navigator+™ will compare the values and, based on the settings, will make adjustments as required. The larger the value, the more often comparisons are made for adjustments.



Password security level 4 or higher is required to access

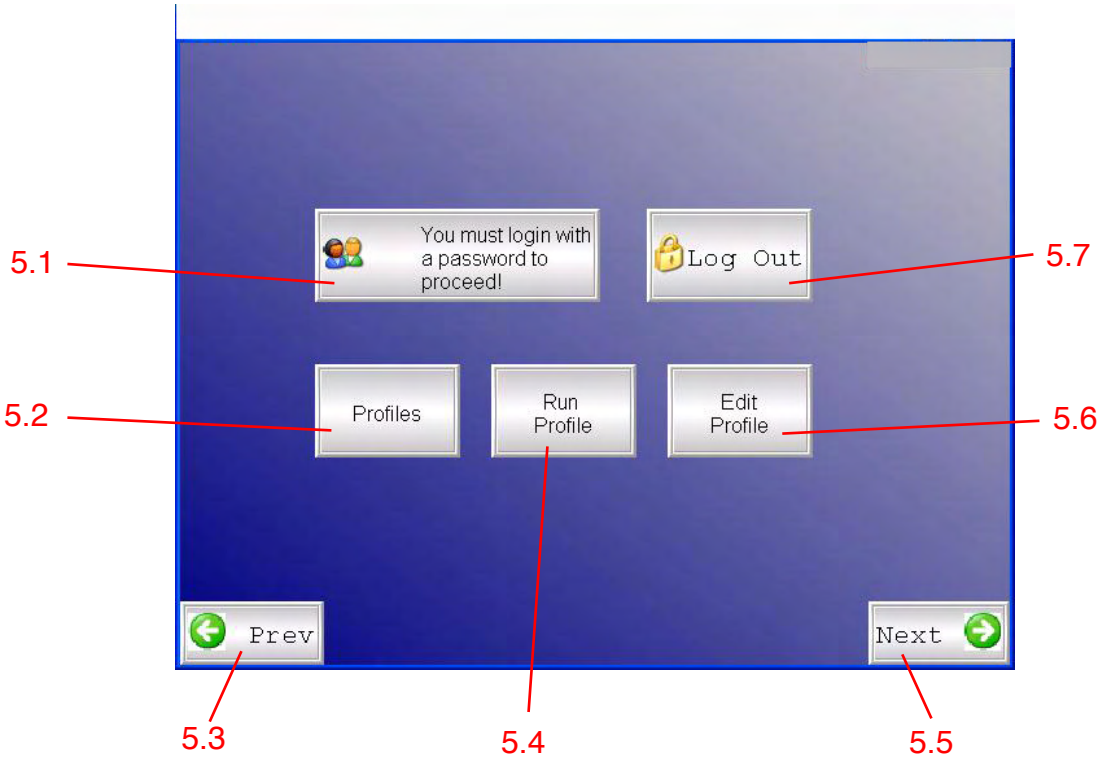


Reverse – Heating Delays - Heat Stage Delay is the amount of time (in seconds) the controller waits between the activation of the first stage of heaters and the second stage of heaters.

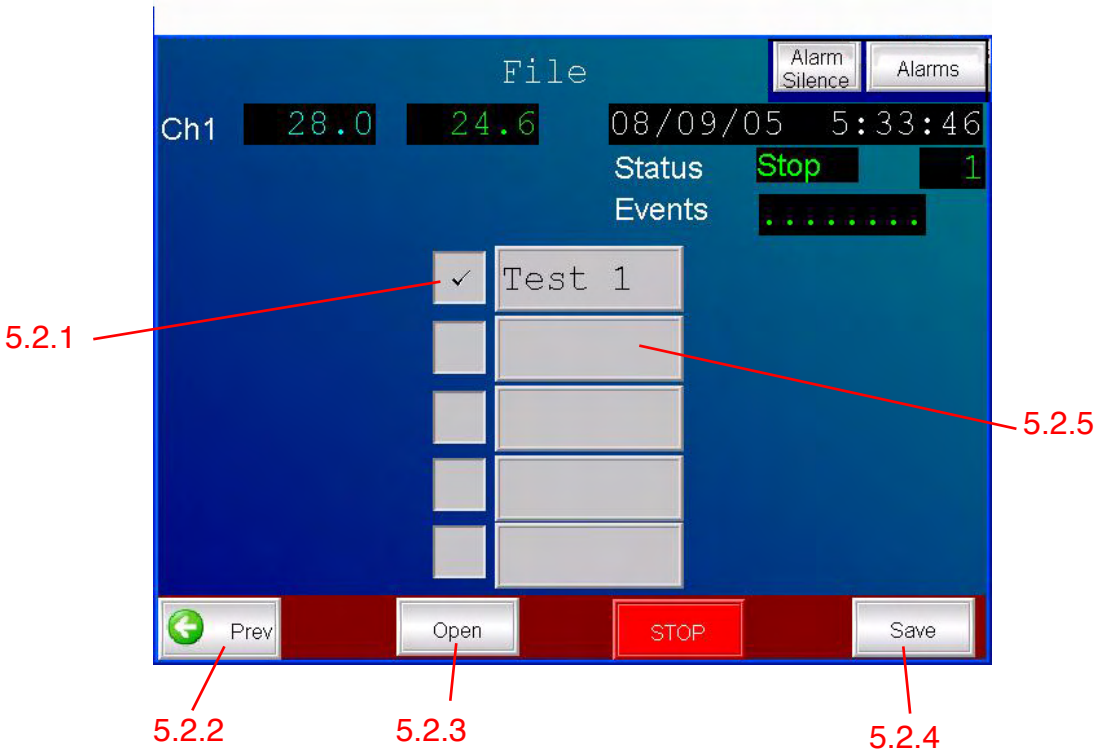
Direct – Cooling Delays - Cool Stage Delay is the amount of time (in seconds) the controller waits between the activation of the first stage of cooling and the second stage of cooling.

4.7.8.1 Stage 2 Heat – if applicable: Refer to electrical print.
4.7.8.2 Stage 3 Heat – if applicable: Refer to electrical print.
4.7.8.3 Stage 4 Heat – if applicable: Refer to electrical print.
4.7.8.4 Stage 5 Heat – if applicable: Refer to electrical print.
4.7.8.5 Stage 5 Cool – if applicable: Refer to electrical print.
4.7.8.6 Stage 4 Cool – if applicable: Refer to electrical print.
4.7.8.7 Stage 3 Cool – if applicable: Refer to electrical print.
4.7.8.8 Stage 2 Cool – if applicable: Refer to electrical print.

Level 1
Level 2 Allows access for System Profile Run (Customer Use)
Level 3
Level 4 Allows access for Program Editing (Customer Use)
Level 5
Level 6 Allows access for Calibration Adjustments (Customer Use)
Level 7
Level 8 Allows access to Factory Settings (Factory Use Only)

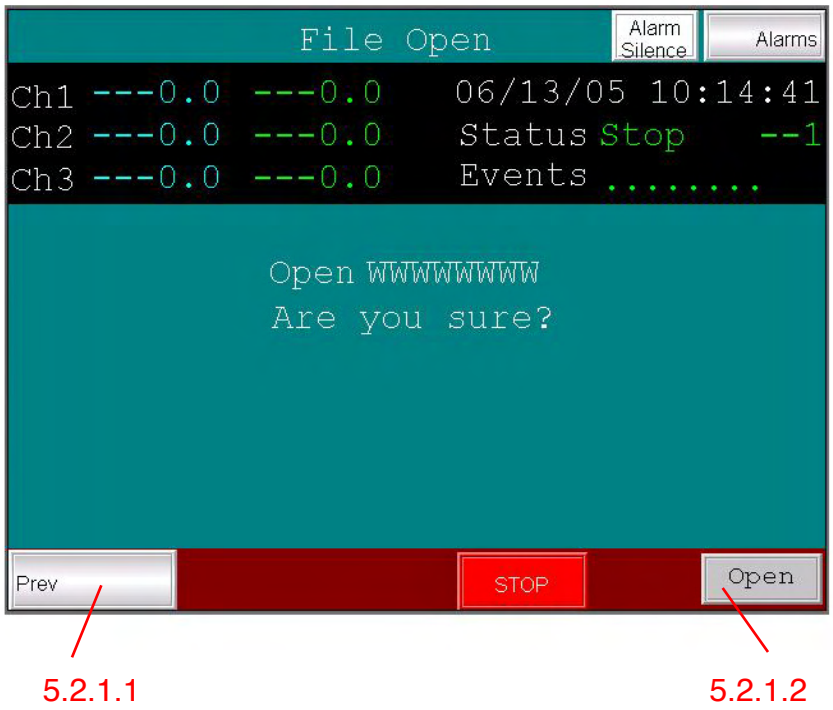


5.1 **Login -** To enter your password at one of six levels.
5.2 **Profiles –** Select from one of five program profiles. (Must be logged in to password level 2 or higher)
5.3 **Prev -** Returns to the main screen.
5.4 **Run Profile -** Brings you to the run program screen. Start time, date etc.
5.5 **Next -** Forwards you to the manual screen.
5.6 **Edit Profile -** Allows for the editing of an currently loaded program profile.
5.7 **Log out -** Removes access to the everything but the stop feature and Manual mode.



5.2 Profiles – Select from one of five program profiles.

- **5.2.1 Profile;** Program profile, check desired profile, and "Open" or "Save"
- **5.2.2 Prev;** Previous page.
- **5.2.3 Open;** Opens the selected file.
- **5.2.4 Saves;** Saves an edited file.
- **5.2.5 File name;** Profile name.

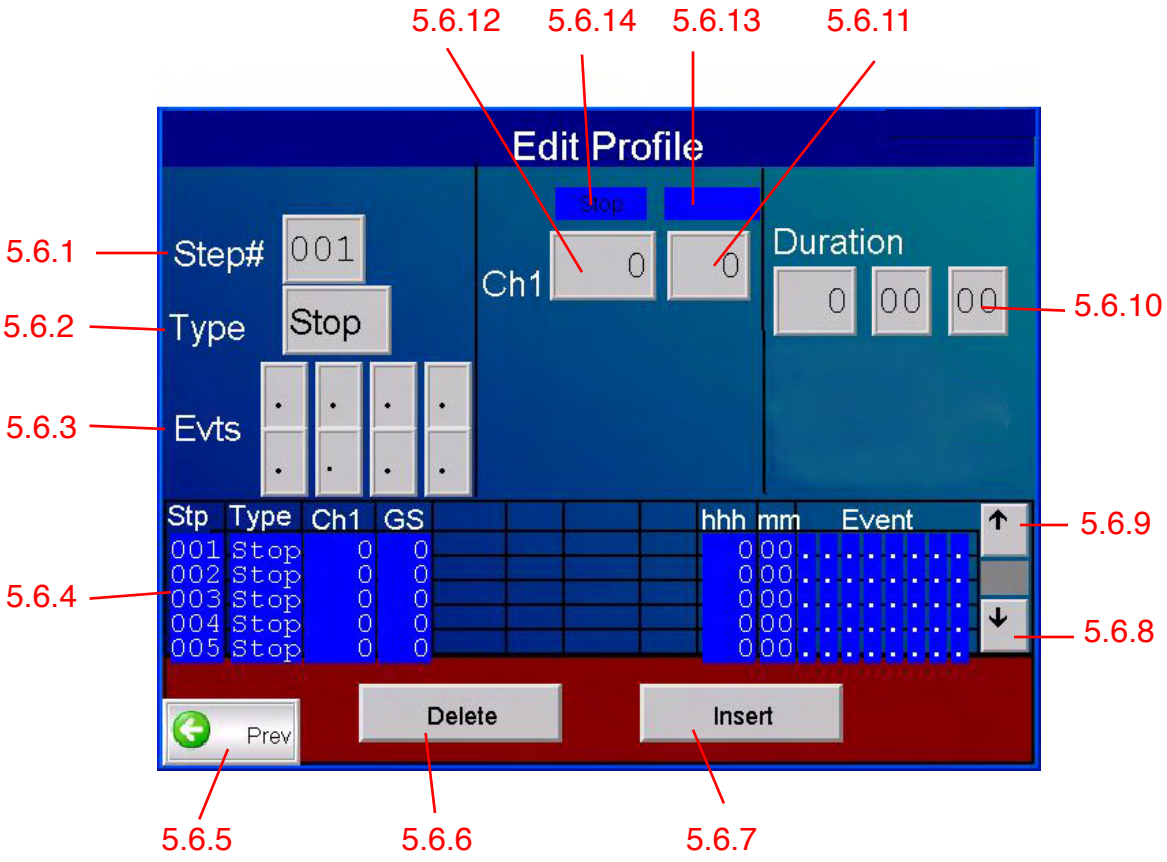


5.2.1 Profile Program profile, check desired profile, and "Open" Verifies your desire to open program.

5.2.1.1 Prev Returns to previous page.

5.2.1.2 Open Opens the desired program profile.

5.2.4.1 Prev
5.2.4.2 OK to save file



5.6 Edit Profile- Allows for the editing of an existing program profile.

- **5.6.1 Step#** Displays step being edited. Touch to change.
- **5.6.2 Type** Displays type of step (Soak,Ramp,Loop, Stop)
- **5.6.3 Events** When number is displayed it is "On"
- **5.6.4 Program display** Shows a 5 step window of program
- **5.6.5 Prev** Returns to Log In menu
- **5.6.6 Delete** Deletes the step shown.
- **5.6.7 Insert** Inserts a step before step shown.
- **5.6.8 Down arrow** Walks through program
- **5.6.9 Up Arrow** Walks through program
- **5.6.10 Duration** Step time interval
- **5.6.11 GS/Loop** Guaranteed soak window on loop to step numbver
- **5.6.12 CH1** Enter desired set point for current step
- **5.6.13** 0 = Blank; 1 = GS Win; 3 = Blank; 4 = Loop to
- **5.6.14** 0 = Stop; 1 = Soak at; 2 = Ramp to; 3 = Loop to

Using the Prev/Next key scroll to the Profiles Page (Figure 5.1)

(Login to a security level of at least two (2) to edit a program.)
(Figure 5.1 Detail 5.1)

Press the Profiles button (Figure 5.1 detail 5.2) and the file screen will open. Select the file you wish to edit by touching the box in front of the desired file. (Figure 5.2 detail 5.2.1) then press open

Then press the Edit Profile button. (Figure 5.1 detail 5.6)

The edit profile screen will now be displayed. (Figure 5.6)

First is to select the step number of your program. (detail 5.6.1) Pressing the button will provide a numerical display. Enter the desired step number (if change is needed) and press the enter key.

Step Type:
Then (if required) select the type of step (detail 5.6.2), soak, ramp, loop or stop.

Programming Events

Each programming step lets you activate any or all of the up to 8 event outputs.

Event Outputs On lets you activate the event outputs 1 through 8 for this step. Enter the output numbers, in any order, of the events you wish to turn on. Any of the 8 events that were not selected will be set to OFF once you hit ENTER and selected ones set to ON.

Determine the events that may be required to perform the step function. To turning an event on touch the button and the number of the event should appear.
Now select the Ch1 temperature (detail 5.6.13) by touching the button. A numerical display will appear. Type in the desired value for your applications step and press the enter key.

Guaranteed Soak
If guaranteed soak (GS) is required press the button identified as (detail 5.6.12) and enter a value via keypad. This value is the numerical amount of deviation allowed before the program can advance.

Guaranteed Soak affects the way a step behaves in terms of its time duration. If G-Soak is ON, (a value entered) the controller will wait until it achieves a process variable within the window and then will begin the countdown for that step TIME DURATION. If G-Soak is OFF, the controller will try to achieve the set point for that step within the TIME DURATION for that step, thus, the controller begins its countdown as soon as the step is begun.

Ch. 1 GS
Ch. 2 GS
Ch. 3 GS

A Value of "0" is the off function for guaranteed soak

Soak Window Adjustment

With Guaranteed Soak on, the TIME DURATION counter does not begin until you have reached your setpoint window. If your Process Variable (P.V.) has any variance outside of the window, your counter will cease until it reaches the setpoint window again.

Example: G-Soak for channel 1 is on, setpoint is at 140 degrees F, but the P.V. varies by 2 or 3 degrees off the setpoint. If the WINDOW for the channel is +/- 5, the steps counter will continue. If the P.V. varies more than 5 degrees off setpoint, the step counter will stop until it is back with-in the specified window.

Note: Using G-Soak in a "ramp" step will cause the controller to stop the program clock and not allow the program to progress. As a result, the program will never advance to the next step. Use G-Soak only in "soak" steps.

Step Time Duration (detail 5.6.11) tells the controller the amount of time this step is to take to achieve the given setpoint (w/ G-Soak OFF), or the amount of time that the step remains at the given setpoint (w/ G-Soak ON). It is in Hours:Minutes:Seconds. The maximum amount of time that can be entered on any one step is 99 hours 59 minutes and 59 seconds.

Selecting a Program to Run

To choose a program to run you must scroll to the profiles screen. Figure 5 Press the "Profiles" button (detail 5.2").

Select a Program Name or Number

You are now on the File screen. Select from one of the five (5) available programs. Figure 5.2 detail 5.2. by placing a checkmark in front of the desired profile. Then press the open button. It will ask you to then acknowledge this selection. Press the open key Figure 5.2.1.1.

Now press the "run" key and follow the Start via Program steps.

Here we will show you the commands available to you via the remote COMMAND mode. This section is divided into 3 sections listed below.

Program & System Control
Manual Control
Alarm Control

In this section, the following conventions are observed:

monospace bold words	are sent to the controller exactly as shown
italicized	represent a variable value to be sent
channel	represents a valid channel number
alarm	represented by ALM and a corresponding number.

All commands are case sensitive and must be in capitol letters.

System Control

These commands control the starting and stopping of the system. They correspond to the options available when the MANUAL and STOP keys on the front panel are pushed.

STPA	has the same effect as pressing the STOP button.
STRM	starts the system in manual mode.

Manual Control

MANWEV*event_num***W** *0/1*	sets the specified event to the specified state. Example: MANWEV1W 1 for “ON” and MANWEV2W 0 for “OFF”
000EV*event_num***R**	returns the current state of the specified event as either 1 for “ON” or 0 for “OFF”.
000SP*channe***lW** *value*	sets the setpoint for a specified channel. Example:000SP1W 235 would be 23.5.
000SP*channe***lR**	returns the specified channel’s setpoint.
PV0*channel*	returns the specified channel’s P.V.

Alarm Control

These commands control and get data about the system alarms

ALM*alarm number*	returns the current state of the specified alarm. Either "0" or "1" is returned. 0 shows alarm is "OFF" and 1 shows the alarm is activated.

Alarms:

Note: Some alarms listed below may not be used on your system. Verify with the electrical print for the alarms for your chamber.

ALM1	Chamber High Heat Limit alarm one (HLS-1)
ALM2	Chamber High Heat Limit alarm two (HLS-2)
ALM3	Circulator Motor Overload (C/OL)
ALM4	HS Oil Pressure Switch (HOPS)
ALM5	HS Thermal Head Switch (HTHS)
ALM6	HS Hi/Lo Pressure Switch (HHLP)
ALM7	LS Oil Pressure Switch (LOPS)
ALM8	LS Thermal Head Switch (LTHS)
ALM9	LS Hi/Lo Pressure Switch (LHLP)
ALMA	HS Water Pressure Switch (WPS)
ALMB	Boiler Over Temp (TAS-1)
ALMC	Temp Sentry
ALMD	Spare Alarm one
ALME	Spare Alarm two
ALMF	Spare Alarm three
ALMG	Spare Alarm four

Example Commands:

000SP1W 250	This command will set the channel 1 setpoint to 25.0.
ALM1	This command will read back the alarm status of Alarm 1.
PV01	This command will read back the current temperature of channel 1.
000EV1R	This command will read back the current status of Event 1. 1 signifies ON and 0 signifies OFF.
000SP1R	This will read back the current setting of Setpoint 1.
STRM	This command will start the controller in manual mode
STPA	This command will stop the controller
MANWEV1W 1	This command will turn on Event 1.

Rules for Command Syntax

Format for Full Command:

STEP# (4 DIGITS)|COMMAND (4 DIGITS)|COMMAND VALUE (5 DIGITS MAX)

Step#:	must be 4 digits long with a space. Ex: [space]001 or [space]025, etc.
Command:	See following pages for command list

Command Value;

IF POSITIVE: [space]VALUE. Ex: [space]1000 or [space]555.
IF NEGATE: NO SPACE. EX: -1000 or -555.

Example of setting step #2, Set point for channel 1 to 105:
[space]002SP1W[space]1050

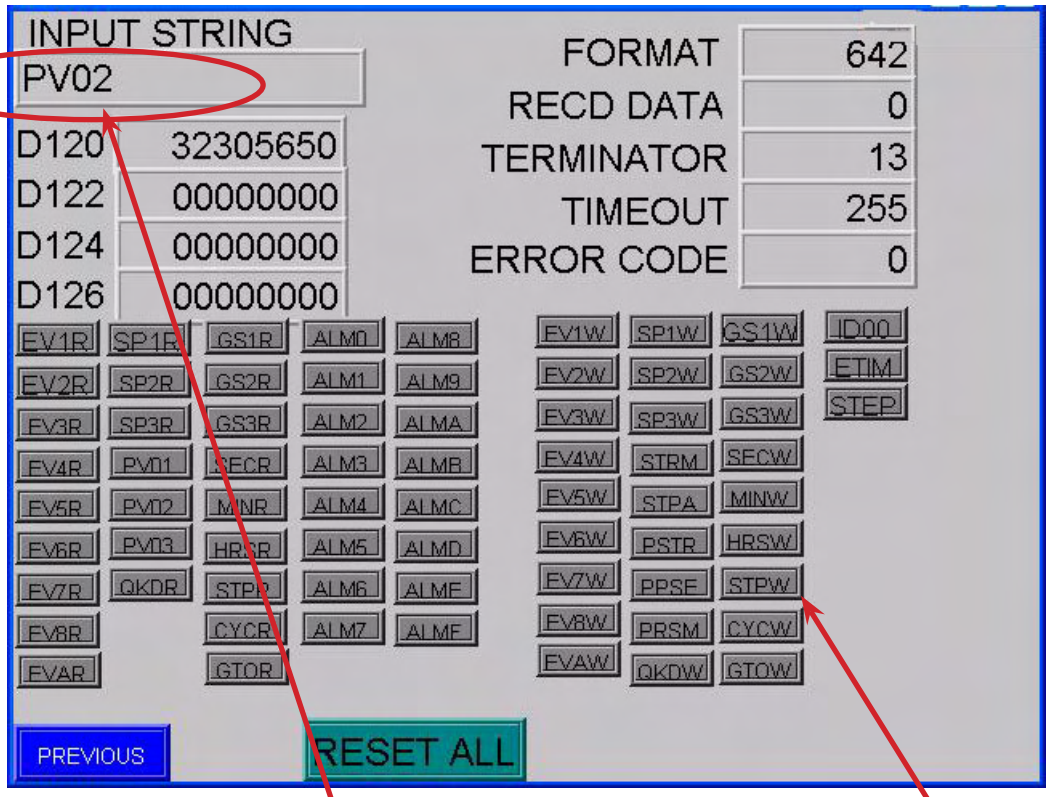
Example of setting manual set point channel 1 to -55:
MANWSP1W-550

Note that all temperature settings are integers with no decimal points. For a temperature setting of 105.6 the command value would scale up by a factor of 10 for a result of 1056.

Current Port Parameters are:

9600 Baud
Odd Parity
Seven data bits
1 Stop bit

This is the ASCII Diagnostics page and can be accessed from the 'Setup menu".



If a correct command is sent, it will display and the corresponding button below will light.
To clear all buttons, press "Reset All".

COMMANDS NAMEASCII	WRITE	Function
PROGRAM MODE		
EVENT 1	000EV1W	ON=1/OFF=0
EVENT 2	000EV2W	ON=1/OFF=0
EVENT 3	000EV3W	ON=1/OFF=0
EVENT 4	000EV4W	ON=1/OFF=0
EVENT 5	000EV5W	ON=1/OFF=0
EVENT 6	000EV6W	ON=1/OFF=0
EVENT 7	000EV7W	ON=1/OFF=0
EVENT 8	000EV8W	ON=1/OFF=0
EVENT ALL	000EVAW	
MANUAL MODE		
EVENT 1	MANWEV1W	ON=1/OFF=0
EVENT 2	MANWEV2W	ON=1/OFF=0
EVENT 3	MANWEV3W	ON=1/OFF=0
EVENT 4	MANWEV4W	ON=1/OFF=0
EVENT 5	MANWEV5W	ON=1/OFF=0
EVENT 6	MANWEV6W	ON=1/OFF=0
EVENT 7	MANWEV7W	ON=1/OFF=0
EVENT 8	MANWEV8W	ON=1/OFF=0
EVENT ALL	MANWEVAW	
SETPOINT 1	000SP1W	SET VALUE
SETPOINT 2	000SP2W	SET VALUE
SETPOINT 3	000SP3W	SET VALUE
SETPOINT 1	MANWSP1W	SET VALUE
SETPOINT 2	MANWSP2W	SET VALUE
SETPOINT 3	MANWSP3W	SET VALUE
GUARANTEE SOAK 1	000GS1W	SET VALUE
GUARANTEE SOAK 2	000GS2W	SET VALUE
GUARANTEE SOAK 3	000GS3W	SET VALUE
SECOND	000SECW	SET VALUE
MINUTE	000MINW	SET VALUE
HOUR	000HRSW	SET VALUE
STEP TYPE	0000STPW	SET VALUE
CYCLE	0000CYCW	SET VALUE
GO TO	0000GTOW	SET VALUE
START CONTROLLER	STRM	START CONTROL
STOP CONTROLLER	STPA	STOP CONTROL
PROGRAM START	PSTR	START PROGRAM
PROGRAM PAUSE	PPSE	PAUSE PROGRAM
PROGRAM RESUME	PRSM	RESUME PROGRAM
QUICK DRAW	QKDW	
NAME	**READ**	
EVENT 1	000EV1R	
EVENT 2	000EV2R	
EVENT 3	000EV3R	
EVENT 4	000EV4R	
EVENT 5	000EV5R	
EVENT 6	000EV6R	
EVENT 7	000EV7R	
EVENT 8	000EV8R	
EVENT ALL	000EVAR	

COMMANDS CONTINUED...

NAME	READ
EVENT 1	MANUREV1R
EVENT 2	MANUREV2R
EVENT 3	MANUREV3R
EVENT 4	MANUREV4R
EVENT 5	MANUREV5R
EVENT 6	MANUREV6R
EVENT 7	MANUREV7R
EVENT 8	MANUREV8R
EVENT ALL	MANREVAR
SETPOINT 1	000SP1R
SETPOINT 2	000SP2R
SETPOINT 3	000SP3R
GUARANTEE SOAK 1	000GS1R
GUARANTEE SOAK 2	000GS2R
GUARANTEE SOAK 3	000GS3R
SECOND	000SECR
MINUTE	000MINR
HOUR	000HRSR
STEP TYPE	000STPR
CYCLE	000CYCR
GO TO	000GTOR
PROCESS VARIABLE 1	PV01
PROCESS VARIABLE 2	PV02
PROCESS VARIABLE 3	PV03
CURRENT STEP NUMBER	STEP
ELAPSED TIME	ETIM
QUICK DRAW	QKDR
NAVIGATOR ID	ID00

ALARMS

NAME	READ
ALARM 1	ALM0
ALARM 2	ALM1
ALARM 3	ALM2
ALARM 4	ALM3
ALARM 5	ALM4
ALARM 6	ALM5
ALARM 7	ALM6
ALARM 8	ALM7
ALARM 9	ALM8
ALARM 10	ALM9
ALARM 11	ALMA
ALARM 12	ALMB
ALARM 13	ALMC
ALARM 14	ALMD
ALARM 15	ALME
ALARM 16	ALMF

To change the IP address on the Navigator+ touch screen, please follow these procedures.

1. Remove power from the touch screen.
2. Open the swing door marked CF CARD.
3. Move Dip Switch 1 to the ON position. **DO NOT MOVE ANY OTHER SWITCHES, THE PROGRAM WILL BE DELETED!**
4. Restore power to the touch screen. When the blue screen appears, touch anywhere on the screen to reach the setup menu.
5. Touch TCP/IP settings.
6. Touch each item to be changed in the window that appears. Each item touched will bring up a pop up window to allow changes.
7. When done, touch OK. This will bring you back to the main menu.
8. Remove power from the touch screen and place the Dip Switch back in the OFF position. Do not forget to close the swing door.
9. Restore power to the touch screen and the new settings will take effect.

˚C to ˚F Conversion

Navigator +™

C	F	C	F	C	F	C	F
-80	-112.00	-35	-31.00	10	50.00	55	131.00
-79	-110.20	-34	-29.20	11	51.80	56	132.80
-78	-108.40	-33	-27.40	12	53.60	57	134.60
-77	-106.60	-32	-25.60	13	55.40	58	136.40
-76	-104.80	-31	-23.80	14	57.20	59	138.20
-75	-103.00	-30	-22.00	15	59.00	60	140.00
-74	-101.20	-29	-20.20	16	60.80	61	141.80
-73	-99.40	-28	-18.40	17	62.60	62	143.60
-72	-97.60	-27	-16.60	18	64.40	63	145.40
-71	-95.80	-26	-14.80	19	66.20	64	147.20
-70	-94.00	-25	-13.00	20	68.00	65	149.00
-69	-92.20	-24	-11.20	21	69.80	66	150.80
-68	-90.40	-23	-9.40	22	71.60	67	152.60
-67	-88.60	-22	-7.60	23	73.40	68	154.40
-66	-86.80	-21	-5.80	24	75.20	69	156.20
-65	-85.00	-20	-4.00	25	77.00	70	158.00
-64	-83.20	-19	-2.20	26	78.80	71	159.80
-63	-81.40	-18	-0.40	27	80.60	72	161.60
-62	-79.60	-17	1.40	28	82.40	73	163.40
-61	-77.80	-16	3.20	29	84.20	74	165.20
-60	-76.00	-15	5.00	30	86.00	75	167.00
-59	-74.20	-14	6.80	31	87.80	76	168.80
-58	-72.40	-13	8.60	32	89.60	77	170.60
-57	-70.60	-12	10.40	33	91.40	78	172.40
-56	-68.80	-11	12.20	34	93.20	79	174.20
-55	-67.00	-10	14.00	35	95.00	80	176.00
-54	-65.20	-9	15.80	36	96.80	81	177.80
-53	-63.40	-8	17.60	37	98.60	82	179.60
-52	-61.60	-7	19.40	38	100.40	83	181.40
-51	-59.80	-6	21.20	39	102.20	84	183.20
-50	-58.00	-5	23.00	40	104.00	85	185.00
-49	-56.20	-4	24.80	41	105.80	86	186.80
-48	-54.40	-3	26.60	42	107.60	87	188.60
-47	-52.60	-2	28.40	43	109.40	88	190.40
-46	-50.80	-1	30.20	44	111.20	89	192.20
-45	-49.00	0	32.00	45	113.00	90	194.00
-44	-47.20	1	33.80	46	114.80	91	195.80
-43	-45.40	2	35.60	47	116.60	92	197.60
-42	-43.60	3	37.40	48	118.40	93	199.40
-41	-41.80	4	39.20	49	120.20	94	201.20
-40	-40.00	5	41.00	50	122.00	95	203.00
-39	-38.20	6	42.80	51	123.80	96	204.80
-38	-36.40	7	44.60	52	125.60	97	206.60
-37	-34.60	8	46.40	53	127.40	98	208.40
-36	-32.80	9	48.20	54	129.20	99	210.20

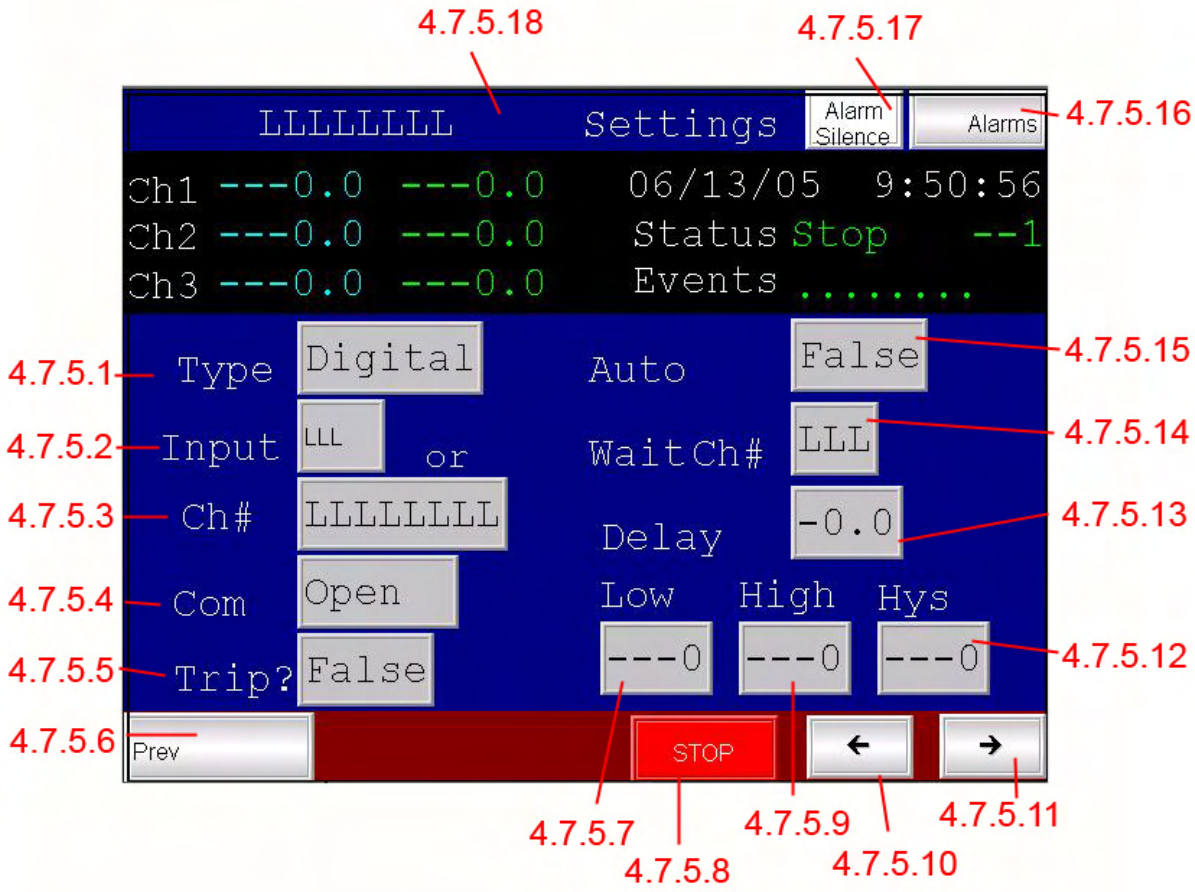
C	F	C	F	C	F	C	F
100	212.00	145	293.00	190	374.00	235	455.00
101	213.80	146	294.80	191	375.80	236	456.80
102	215.60	147	296.60	192	377.60	237	458.60
103	217.40	148	298.40	193	379.40	238	460.40
104	219.20	149	300.20	194	381.20	239	462.20
105	221.00	150	302.00	195	383.00	240	464.00
106	222.80	151	303.80	196	384.80	241	465.80
107	224.60	152	305.60	197	386.60	242	467.60
108	226.40	153	307.40	198	388.40	243	469.40
109	228.20	154	309.20	199	390.20	244	471.20
110	230.00	155	311.00	200	392.00	245	473.00
111	231.80	156	312.80	201	393.80	246	474.80
112	233.60	157	314.60	202	395.60	247	476.60
113	235.40	158	316.40	203	397.40	248	478.40
114	237.20	159	318.20	204	399.20	249	480.20
115	239.00	160	320.00	205	401.00	250	482.00
116	240.80	161	321.80	206	402.80	251	483.80
117	242.60	162	323.60	207	404.60	252	485.60
118	244.40	163	325.40	208	406.40	253	487.40
119	246.20	164	327.20	209	408.20	254	489.20
120	248.00	165	329.00	210	410.00	255	491.00
121	249.80	166	330.80	211	411.80	256	492.80
122	251.60	167	332.60	212	413.60	257	494.60
123	253.40	168	334.40	213	415.40	258	496.40
124	255.20	169	336.20	214	417.20	259	498.20
125	257.00	170	338.00	215	419.00	260	500.00
126	258.80	171	339.80	216	420.80	261	501.80
127	260.60	172	341.60	217	422.60	262	503.60
128	262.40	173	343.40	218	424.40	263	505.40
129	264.20	174	345.20	219	426.20	264	507.20
130	266.00	175	347.00	220	428.00	265	509.00
131	267.80	176	348.80	221	429.80	266	510.80
132	269.60	177	350.60	222	431.60	267	512.60
133	271.40	178	352.40	223	433.40	268	514.40
134	273.20	179	354.20	224	435.20	269	516.20
135	275.00	180	356.00	225	437.00	270	518.00
136	276.80	181	357.80	226	438.80	271	519.80
137	278.60	182	359.60	227	440.60	272	521.60
138	280.40	183	361.40	228	442.40	273	523.40
139	282.20	184	363.20	229	444.20	274	525.20
140	284.00	185	365.00	230	446.00	275	527.00
141	285.80	186	366.80	231	447.80	276	528.80
142	287.60	187	368.60	232	449.60	277	530.60
143	289.40	188	370.40	233	451.40	278	532.40
144	291.20	189	372.20	234	453.20	279	534.20

Sensor Descriptions

Range Accuracy (typical @ 25°C and 5 VDC)

Description	Typical Accuracy
± 15 mV	± 0.03 mV
± 50 mV	± 0.015 mV
± 100 mV	± 0.0055 mV
± 500 mV	± 0.005 mV
± 1 V	± 0.005 V
± 5V	± 0.005 V
± 20 mA	± 0.008 mA
J Thermocouple 0 to 760 ˚C	± .4˚C
T Thermocouple -100 to 400˚C	± .5˚C
Available Selections	
0 - 10 VDC	
± 10 VDC	
4 - 20 mA	
J Thermocouple ˚C	
T -Thermocouple ˚C	
T -Thermocouple ˚F	

Figure 4.7.5 • Alarms if used by Factory in Analog Mode



4.7.5.1 Type of alarm signal (i.e. digital or analog) .
4.7.5.2 Input selection for digital alarms.
4.7.5.3 Channel selection for analog alarms.
4.7.5.4 Common state of digital type alarms.
4.7.5.5 Specifies if controller should halt if alarm occurs.
4.7.5.6 Return to the Set Up menu.
4.7.5.7 Low limit for analog type alarms.
4.7.5.8 Stop System.
4.7.5.9 High limit for analog type alarms.
4.7.5.10 Go to the previous alarm for setup.
4.7.5.11 Advance to the next alarm for setup.
4.7.5.12 Hystersis setting for analog type alarms.
Operating window to prevent a short cycling of the switch.
Sometimes referred to as a make or break value. Example: Open at 10 PSI Close at 20 PSI
4.7.5.13 Duration of time alarm must be active before registering. True is auto / False is manual.
4.7.5.14 Inf secondary analog sensor is on another channel - wait until both show trip.
4.7.5.15 Alarm automatic reset.
4.7.5.16 Brings you to the alarm page.
4.7.5.17 Silences the audible alarm bell.
4.7.5.18 This is the name of the alarm.

Accessible at Password Level 4